ONTARIO MINISTRY OF ENVIRONMENT
36936000022244

REPORT of TASK FORCE ONAKAWANA

A preliminary investigation of the Environmental Effects of Development of Onakawana Lignite Deposits.

January, 1973.

MOE
REP
ARIX

c.1
a aa

Ontario
Ministry of the Environment

The Honourable George A. Kerr, Q.C., Minister

Everett Biggs, Deputy Minister

LIBRARY & RESOURCE CENTRE
MINISTRY OF THE ENVIRONMENT

R E P O R T

of

TASK FORCE ONAKAWANA

A preliminary investigation of the
Environmental Effects of Development
of Onakawana Lignite Deposits.

January, 1973.

Environment Ontario
Laboratory Library
125 Resources Rd.
Etobicoke, Ontario M9P 3V6
Canada

Members of the Task Force

Chairman

Everett Biggs
Deputy Minister
Ministry of the Environment

H. A. Clarke
Assistant Director
Industrial Wastes Branch
Ministry of the Environment

G. Faries
Local Representative
Moosonee

Prof. Richard Forster
Conservation Council
of Ontario

G. R. Guillet
Chief, Geological Branch
Ministry of Natural Resources

Q. F. Hess
Environmental Quality Co-ordinator
Ministry of Natural Resources

P. B. Lind
Conservation Council
of Ontario

C. B. Martin
Chief of Approvals and Criteria
Air Management Branch
Ministry of the Environment

J. H. Neil
Director
Water Quality Branch
Ministry of the Environment

T. B. Reynolds
Plant Development Engineer
Ontario Hydro

R. Standfield
Principal Ecologist
Policy Research Branch
Ministry of Natural Resources

D. V. T. Swyers
Management Board Analyst
Management Board

T. J. Yakutchik
Water Quantity Management Branch
Ministry of the Environment

Executive Director

J. W. Gilbert
Director
Strategic Planning
Ministry of the Environment

Digitized by the Internet Archive
in 2015

https://archive.org/details/reportoftaskforc22244

TO THE HONOURABLE A. B. R. LAWRENCE, Q.C.

PROVINCIAL SECRETARY FOR RESOURCES DEVELOPMENT

We, the members of Task Force Onakawana appointed to investigate the environmental effects of the proposed development of the Onakawana lignite deposit, respectfully submit this report.

Everett Biggs

Tony Gabrielcic

B Martin

L. [illegible]

Richard Foster

Philip R Lind

David V. T. Sugers

[illegible]

James W. [illegible]

[illegible]

John [illegible]

[illegible]

Orpa Guillet

Gilbert G. Francis

TABLE OF CONTENTS

	PAGE
Table of Contents	i
List of Maps and Tables	iv
List of Photographs	iv
Foreword	1
Section I - SUMMARY AND RECOMMENDATIONS	2
Section II - BACKGROUND	17
Section III - PHYSICAL AND CLIMATIC BACKGROUND	22
Climate	22
Geology	22
-Bedrock	22
-Surficial Deposits	23
-Landscape	23
-Drainage	27
Soils	27
-Description and Analysis	27
-Soil Temperatures	29
SECTION IV - DEVELOPMENT PROBLEMS RELATED TO SOILS	30
Removal and Stockpiling of Muskeg	30
Erosion	30
Slope Stability	31
Leachate Problems	33
Pumping of Mine or Drainage Waters	35
Heavy Metal Contamination	35
Disposal of Ash Materials	35
Site Rehabilitation	36
Disposal of Sewage Effluent	37
Conclusions	37
Acid Leachate	37
Surface Drainage	38
Erosion	38
Problems of Slope Stability	38
Water Discoloration	38
Planning	38
Site Improvement	38
Experience	38

PAGE

SECTION V - WATER RESOURCES 39

A Surface Water 39
Assessment Procedure 39
Withdrawl of Water 40
Return of Cooling Water 41

B Impact on Ground Water Resources 41
Effect of Waste Disposal 41
Effect on Ground Water Flow System and Productivity of Aquifers 41
Effect of Ground Water Disposal on surface Waters 41
Conclusion 42

C Anticipated Impact on Aquatic Resource 42
Thermal Effects 42
Chlorination of Condenser Water 43
Ash Disposal 43
Flow Regulations 43
Diversion of the Onakawana River 44
Mining the Headwaters of Medicine Creek 44
Mine Water Disposal 44

SECTION VI - BIOLOGY OF THE REGIONS 46

A Vegetational Characteristics 46
Black Spruce Muskeg 46
Mixed Feather Moss Forest 46
White Spruce Forest 46
Disturbed Areas 47
Impact 47

B Fish and Wildlife 48

Fish Species
-Abitibi River 48
-Onakawana River 48
-Mattagami River 49
-Medicine Creek 49

Bird Species 49
-Waterfowl 49
-Upland Game Birds 50
-Non Game Birds 50

Mammals 50
-Furbearers 50
-Big Game 51
-Predators 51
-Other Mammals 51

Amphibian and Reptiles 51

PAGE

SECTION VII - ECONOMIC AND SOCIAL IMPACT

A Parameters of the Analysis 52

B Direct Impact Calculation 53
Construction Phase 53
Money Flows 54
Summary of Primary Impacts 55
Operating Phase 55
Employment 55
Money Flows 56
Secondary Impact 56
Summary of Primary and Secondary Impacts 58
Availability of Local Labour 58
Other Miscellaneous Factors 60
Possible Location for New Population 61
Implication of Increased Passenger Traffic 62

SECTION VIII - ADDITIONAL WORK TO BE DONE 63

A With Regard to Onakawana 63

B With Regard to Baie James Project 64

STUDY PROCEDURE 64

LIST OF MAPS AND TABLES

			PAGE
Map	1	Location of Onakawana in Northern Ontario	14
Map	2	Location of Onakawana on Ontario Northland Railway	15
Map	3	Location of the Onakawana Lignite Deposits	16
Table	I	Analyses of two samples of water from the Onakawana area	34
Table	II	Experience and/or Trained Men Available in the Moosonee-Moose Factory-Fort Albany-Attawapiskat area, November 1972.	58

LIST OF PHOTOGRAPHS

View of Black Spruce muskeg between Medicine Creek and the Mattagami River. 24

View of transition zone vegetation by Medicine Creek. 24

View of the Abitibi River showing the variation of vegetation from lush tree growth on the riverbank to muskeg in the hinterland. 25

View of the Mattagami River directly west of Onakawana. 25

View of Onakawana River at Onakawana showing improved forest growth along the river bank. 26

View of spoil piles at Onakawana resulting from activities in 1968 (note lignite pile in foreground). 32

Photographic prints are available from

the Ministry of the Environment

FOREWORD

This report has been prepared in compliance with the May 9, 1972 instruction of the Provincial Secretary for Resources Development, that a Task Force prepare a preliminary statement on the environmental impact of a proposed development of the Onakawana lignite deposits.

The Task Force was instructed to report its findings prior to the completion of the economic feasibility studies being undertaken by Manalta Coal Limited, Ontario Hydro and the Province of Ontario in order that the cost of amelioration of potential damage to the environment would be given due consideration in determining the feasibility of the proposed project. The possibility of a subsequent, more detailed investigation is anticipated in the Terms of Reference.

The Terms of Reference of the Task Force are as follows:

-to investigate, in general terms, the environmental effects which would be brought about by the development of the Onakawana lignite deposits;

-to obtain the preliminary views of groups concerned with environmental protection;

-to lay out a work programme for more detailed investigation of any significant enviromental effects indicated by the general investigation;

-to provide some estimates of special cost which would be incurred in minimizing environmental impact;

-to give further consideration to the environmental impact of the Baie James project, seek views of any groups which have studied the project and to report its findings at the same time as it reports on the Onakawana Project.

The Task Force established that there is little to link the proposed development at Onakawana to the Baie James Project and recommended that examination of the Baie James Project should follow the report that is specific to the development proposed at Onakawana; an extension was obtained on this section of the report to allow the analysis of the Baie James Project to be free of the narrow time constraints that relate to the examination of the Onakawana Project.

SECTION 1 - SUMMARY AND RECOMMENDATIONS

The completeness of the examination of the impact on the environment of the mining of lignite at Onakawana and the construction of a 900 Mw thermal generating station is limited by the fact that economic-engineering studies have not been completed. The Manalta Coal Company Ltd. has been granted an exploration permit on the properties and has indicated an interest in mining the lignite and in building and operating a thermal-electric generating station using the lignite as fuel. There are no specific construction plans and presumably such plans must await the completion of the engineering-economic feasibility study.

PRESENTLY NO ENGINEERING PLAN

In the absence of a firm engineering plan, Task Force Onakawana has made assumptions as to the probable developmental procedures. These were dealt with in Section I. If these assumptions, once the engineering study is complete, prove to be ill-founded, the impact of the development on the environment may be altered. The conclusions relate to the assumptions made. Before a development permit is granted the actual engineering plans should be related to the assumptions upon which this report has been based.

RECOMMENDATION #1

> *That the regulatory authorities be charged with examining the final engineering plans for the development of Onakawana and assuring that departures from the assumptions made in this report as to the way in which the project will be engineered are basically correct and that modifications are not such as would result in unanticipated damage to the environment.*

* * * *

DEVELOPER PAY COST

It is the view of the Task Force that in general principle the cost of determining the impact of a development such as this on the environment is a legitimate part of the engineering-economic feasibility study. A developer should bear the cost of satisfying the appropriate Ministries that development and production costs are not being reduced through failure to fully protect the environment. The costs of environmental protection and repair should be built into the feasibility study; from the beginning they should appear in the budget of development and operation rather than subsequently arising as an unbudgeted cost.

RECOMMENDATION #2

That the economic-engineering study to be undertaken by the development corporation concurrently examine the environmental impact of the development and define to the satisfaction of the Ministries the relationship of the development to the environment during the period of construction, operation and the post-operation period.

* * * *

ALTERNATIVE USES

The only utilization of the lignite that has been considered in this report is for the firing of a thermal-electric generating station. The Task Force recognizes that all energy developments have impacts upon the environment but has not considered whether some other use of the lignite would have a greater or a lesser impact on the environment.

This deposit is an important potential asset within the economy of the lower Moose River Basin, but in the context of the total provincial economy it is not large. The production of 900 megawatts of electrical energy, when considered relative to the present capacity of the Ontario Hydro system, would be slightly less than six per cent, declining to a quarter of that proportion by 1990. Failure to receive electrical energy from the conversion of the lignite deposits at Onakawana would not prejudice the adequacy or security of supplies of electricity in Ontario. The Task Force has not considered whether an alternative use for this energy source might, for example, permit the energy to be used locally and result in a greater economic impact in terms of regional development.

As this examination confirms, this part of the lower Moose River Basin has not been extensively developed in terms of natural resources. The forest resource is relatively limited, game and fur resources are not plentiful, mineral and petroleum resources are unproven or presently uneconomic. Surface indications of coal and lignite deposits exist but the only major, proven natural resource with respect to which there is a development proposal is the deposit of lignite at Onakawana, now estimated at 170 million tons.

It is one of the concerns of the Task Force that the utilization of this resource should take full cognizance of the human environment - the reasonable social and economic expectations of the people that live in the region and, in particular, the people who live downstream from the lignite deposits. An associated concern is that exploitation of the lignite resource at Onakawana should only be authorized if the proposed use will contribute more than any alternative use to the standard of life of the people of the region. It has not been finally proved that, in this context, the present proposal is the highest use.

RECOMMENDATION #3

> *That all potential alternative uses for the lignite deposits at Onakawana be measured against the criterion of the contribution that the proposed development will make to the economic and social well-being of the people living within the region.*

* * * *

ORIGINAL ENVIRONMENTAL QUALITY

The Task Force reiterates that the development of energy inevitably results in damage to the natural environment and acknowledges that the central importance of a secure and adequate supply of energy is such that compromises are unavoidable and necessary. However, the strip mining of coal or lignite and its conversion into thermal energy can be very damaging if exploitation is allowed to take place without responsible regulation and precise planning.

In a study entitled Environmental Management prepared for the Government of Canada by J. W. MacNeill and published in January, 1971 the following statement is made and, though it is not directly pertinent to the circumstances at Onakawana, the Task Force feels it is worth quoting to indicate that care must be exercised when lignite is strip mined:

> "The severity of discharges from coal and hard-rock mines into water resources depends on the mine locations, local topography and other factors. The run-off from waste piles and underground workings may contain acid or alkali or excessive concentrations of dissolved substances such as iron, manganese, and copper, as well as the salts of metals such as zinc, lead, arsenic, copper and aluminium. Erosion of waste piles and access roads can result in large quantities of sediment being discharged into streams. Acid drainage and sedimentation can affect the use of waters in several ways. It can greatly increase the cost of downstream treatment for domestic and industrial use. It can preclude recreational uses. Even in a minute concentration, salts of metals such as zinc, lead, arsenic, copper and aluminium can kill fish and other aquatic life and destroy their food chain and habitat. The effects can be contained within a country or province or they can be supra-provincial or international in scope. No estimates are available of the present extent of the side effects of mine drainage in Canada, but they are known to be serious in several areas. With mining activity expected to quadruple by 1990, government and industry will have to devote much greater attention to these problems."

The region that will be disturbed by the development of the lignite deposits at Onakawana is not rich in resources. As previous sections of this report make clear it is low lying, poorly drained, has a poorly structured soil and is not rich in timber and in bird, animal or fish life. It is also remote from the main centres of population. Task Force Onakawana, nonetheless, is of the opinion that, if not for other reasons, at least of points of hard principle, regulations leading to minimum deterioration of the environment and maximum restoration should be as rigorously applied as though the region were rich in resources or near population centres. Land and space, whether rich or poor in terms of the production of resources, is valuable in itself and part of the legitimate cost of the exploitation of one resource must be the protection of the quality of all other resources of land, air and water irrespective of their original quality. The Task Force is inflexible in its view that nothing done at Onakawana should degrade the water of the rivers to the detriment of any of the important resources of the people living down river.

RECOMMENDATION #4

> *That the acknowledged fact that the proposed site of the development at Onakawana is remote and is not rich in forest, soil, wildlife and other resources, as compared with some of the naturally productive regions of Ontario, not be considered justification for any relaxation of the regulations designed to protect the environment and that the environment not be damaged to an extent considered avoidable and be restored as quickly as practicable.*

* * * *

FURTHER INVESTIGATION

The time frame within which Task Force Onakawana has completed its investigations has not permitted examinations to take place throughout all seasons of the year and, further, the time pressure has been such that some of the investigations of necessity have been relatively superficial. It is the view of the Task Force that additional investigation is necessary and members, in signing this report, have noted that this is a preliminary examination carrying the clear implication that further work will be completed prior to the decision as to whether to grant a permit to develop the lignite deposits. SECTION VIII, which follows, indicates areas where additional research and investigation is required.

RECOMMENDATION #5

That further environmental investigation be required prior to the granting of a development permit given that the time frame within which research has been done and the understanding that this examination was preliminary to further investigations has resulted in some of the conclusions being based upon inadequate data, investigation and research.

* * * *

AREA RESTORATION

If it is established that the development of a mine and a thermal-electric generating station is economically feasible any return will accrue to the developer. One of the economic costs is the avoidance of doing violence to the other resources in the area. An important aspect of the protection of the environment is the restoration of the area.

RECOMMENDATION #6

That the cost of restoration and reclamation of the affected area be borne by the developer, and a fund be created from a levy per ton of lignite removed and held in trust to be progressively refunded to the developer only upon written approval of the appropriate Ministries as to the adequacy of the restoration of the site.

* * * *

WATER QUALITY AND QUANTITY PROTECTION

The major specific concern of the Task Force relates to the water of the rivers of the area. Experience in Ontario with respect to the use of rivers for the receipt of the outflow of cooling water from thermal-electric generating stations is limited and, further, aquatic ecologists in Ontario are not well informed as to the impact of changes of water temperature upon aquatic life. This lack of knowledge becomes particularly serious when it is noted that a 900 megawatt electric generating station, such as is proposed at Onakawana, can require an intake of 800 cubic feet per second of water and occasions have been recorded when the flow of the Abitibi River is only 700 cubic feet per second. Summer-fall low flows tend to coincide with the relatively high background water temperatures of the summer season and, clearly, it would be wholly unacceptable to return 800 cfs of water, that is 15 to 18 Centigrade degrees above ambient, at low flow periods to this river; nor would it be acceptable to withdraw 800 cubic feet per second of water during the low flow period if in so doing the stream flow is seriously depleted downstream of the inlet device.

The Task Force noted that there is an absence of good scientific data in Ontario bearing upon the impact on aquatic life of using rivers for cooling the water from thermal-electric plants. If rivers are to be used more generally for such cooling additional research will be needed.

SECTION V outlines six possible cooling procedures, any one of which might be an acceptable solution to the problem of the relationship of the supply and disposal of cooling water to the flow of the rivers. The Task Force acknowledges that determination as to which procedure is the most desirable must be part of the engineering-economic feasibility study but this acknowledgement is made with the reservation that whichever is chosen must not result in the thermal pollution or adverse depletion of the Abitibi River.

RECOMMENDATION #7

That the appropriate regulatory agencies audit very carefully the procedures proposed by the development company for the withdrawl of water from the river and cooling of the water from the thermal-electric generating station and confirm that the proposed procedure has no unacceptable and deleterious impact on the waters of the rivers of the area.

* * * *

WASTE WATER DISPOSAL

Many aquatic species have a low tolerance with respect to chlorine and chlorine is typically added to the cooling water to prevent fouling within the condensers of thermal generating stations; further, fly ash will be precipitated and fly ash and the bottom ash may be transported for disposal in water and the water used for this purpose is deteriorated in terms of quality; poor colour and turbidity may distinguish water that finds its way into the pit from precipitation, leachate or as ground water. Other examples could be cited but these three examples confirm that water of a quality that is inferior to the water in the rivers in the area will have to be removed and if indiscriminately dumped into the rivers will have negative impacts on the aquatic life of the rivers.

RECOMMENDATION #8

That water pumped from the mine pit, used to transport fly ash or bottom ash, water used to cool the condensers or water used for other purposes which damage quality be so treated that when returned to flowing streams or rivers in the area, the result is not the deterioration of the water in the receiving river or stream.

* * * *

ONAKAWANA RIVER AND MEDICINE CREEK

There would appear to be no alternative to the destruction of the headwaters of Medicine Creek by the construction of the mine and the diversion into the Abitibi River of the Onakawana River upstream from the mine site.

The diversion will result in the loss of the final five miles, more or less, of the Onakawana River. The Task Force acknowledges that this is probably unavoidable but has some concerns. It is concerned that the erosion of clay particles from the new channel should be held to a minimum. It is concerned that it is not known to what extent the brook trout in the upper reaches of the Onakawana River use this river as a migration route and it is concerned that any deterioration of water quality in the diversion channel might inhibit the passage of fish. It is concerned as to the possibility of restoring the Onakawana River to its original channel at such time as the lignite resource is fully exploited and it is concerned that the original channel of the Onakawana River below the diversion should not be utilized for purposes during the production period that will eliminate any future possibility of its ultimate restoration. It is concerned that the lower reaches of Medicine Creek should not become a source of low quality water into the rivers of the area.

RECOMMENDATION #9

That if the engineering feasibility study confirms that the Onakawana River must be diverted, this be accepted subject to minimum erosion and minimum deterioration of water quality in the diversion and, further, the possibility of the subsequent restoration of the Onakawana River to its original outflow channel not be irrevocably prejudiced.

* * * *

RECOMMENDATION #10

That if the engineering feasibility study confirms the unavoidability of the destruction of the headwaters of Medicine Creek this be accepted, subject to the protection of the quality of the water in the downstream portion of the creek.

* * * *

SPOIL PILE FERTILITY

With the exception of the better drained margins of rivers and creeks, tree and plant growth at Onakawana is very limited due to poor drainage and the associated low soil temperature. The stripping of the soil from above the lignite

deposits will obviously result in increased soil erosion but, if carefully planned, the developmental activities can result in an off-setting improvement in drainage and a resulting improvement in plant growth and carrying capacity for wildlife. Further, if in economic and engineering terms it is practicable, the stockpiling of the organic materials and their subsequent blending with the exposed tops of the spoil piles will result in an improved soil structure and a better environment for plant growth. Observations of existing spoil piles from earlier workings at Onakawana confirm that natural revegetation at best is very slow and that if good plant growth is to be achieved positive steps must be taken to improve soil drainage, fertility and friability. Slope stability and erosion control demand that the spoil piles should be rounded and, ideally, should be terraced.

RECOMMENDATION #11

> *That a careful and relatively detailed plan of rehabilitation which has received the approval of the appropriate Ministries be formally filed before site development is undertaken and the developer be committed to on-going and final restoration of the site according to the plan.*

* * * *

RESEARCH IN ALL SEASONS

Because forest, fish and wildlife are directly dependent upon soil, water and air, satisfying the environmental considerations in these areas will tend to result in minimum environmental damage in terms of vegetation and land and aquatic species. The loss of habitat in the immediate vicinity of the development area will result in the displacement of some populations but this may be relatively minor.

It is possible for some benefits to accrue. Replacement of the soils as recommended in this report should increase vegetation and to a degree improve the habitat for some wildlife species. The creation of lagoons between the ridges of spoiled earth, if appropriately handled, can result in an environment that is attractive to some aquatic species.

Maintenance of the quality of the water in the Abitibi River and Moose River is of the first order of importance to the maintenance of an appropriate environment for the aquatic species.

Some environmental deterioration is probably unavoidable. It is unfortunate that the time frame in which research and investigation had to be completed was less than the annual seasonal cycle.

RECOMMENDATION #12

That research programs with respect to fish and wildlife in the Onakawana area be continued in the four seasons of the year in order to obtain a more precise inventory.

* * * *

AIR QUALITY

Air quality is important to the vegetation, wildlife and human use of the Onakawana area. The potential air management problems associated with a 900 megawatt lignite fired thermal generating station have been reviewed. Analysis of the lignite recovered in the 1972 program show that the material has a moisture content of 40 per cent to 50 per cent by weight, an ash content of 4.8 per cent to 14.8 per cent and a sulphur content of .13 per cent to 1.5 per cent. The concentration of sulphur in coal burned in Ontario's thermal electric generating station is typically between 1.0% and 2.5%. An equivalent sulphur content for the Onakawana lignite is 1.0% to 1.5% - somewhat lower than the average of the coal now being burned. It is assumed that the plant will burn up to 18,000 tons of lignite a day, which will result in 8,000 to 9,000 tons of water vapour being released into the atmosphere and will also result in the generation of about 2,000 tons/day of fly and bottom ash. The water vapour will cause the plume from the power station to be visible for a considerable distance from the plant.

In respect to the fly and bottom ash, this material will require careful handling and ultimate disposal. If lagoons and landfill sites are used for disposal, dissolved solids in the supernatant water or leachate may pose problems; transporting, conveying, spreading, sintering, etc., could cause local dust problems with possible vegetation injury.

It is known that frequent stagnant low level (300-500 feet) inversions are common in the Onakawana area. For this reason the stack exhausting the plant should be in the order of 500 feet high to ensure dispersion of the flue gases. Also because of the high ash content in the fuel, highly efficient electrostatic precipitators should be used to collect the fly ash.

Using the range of sulphur content reported, the anticipated concentration of SO_2 from a 500 stack would be 0.07 to 0.17 parts/million at a distance of 13,000 feet downwind. Mixing of lignite from the high and low sulphur content seams may be worth considering to maintain minimum SO_2 concentrations. Under the design conditions assumed, it is unlikely that the vegetation, including lichens, will be adversely affected by the SO_2 concentrations anticipated. With the use of electrostatic precipitators the concentrations

of suspended particulate matter and metal oxides from the stack are likely to be well below the specified maxima.

RECOMMENDATION #13

> *That the effluent gases from the Power Station be admitted to the atmosphere at a minimum height of 500 feet above grade with a minimum exit velocity of 80 feet per second at full load, and that the developer receive approval of the appropriate Ministries in respect to the handling and ultimate disposal of fly and bottom ash.*

* * * *

EMPLOYING LOCAL PEOPLE

It bears reiteration that the fundamental justification for approving the development of the lignite deposits is the favourable effect that this might have on the economic and social well-being of the local people, many of whom are people of Indian ancestry. The movement into the area of hundreds of workers from outside, particularly during the construction period, cannot fail to cause some tensions and some disturbance to local cultures and life patterns. There is, however, a shortage of employment opportunities relative to the number of able-bodied workers resident in the region and the provision of available and acceptable work could markedly improve local employment and economic opportunities. If workers are imported from beyond the borders of the region and there is not a serious and sustained effort to train local people to qualify for most of the available positions the end product will be that the residents of the region will receive any environmental damage that might result, will be forced to accommodate to the cultural shock that is inevitable with a large influx of "outside" people, will have to bear the costs of pressure on housing and the costs of new infrastructure and, at the same time, will receive a minimum of the real benefit of development.

The maximum employment of local people will be beneficial for several reasons. The first and most obvious reason is the provision of wage labour in communities that presently are confronted with an employment problem. In addition, it will result in on-the-job training and will improve the skills of local workers. Further, it will reduce to the essential minimum the influx of new people into the existing communities and will proportinately reduce the social tensions.

RECOMMENDATION #14

> *That a requirement in the granting of a permit to mine the lignite deposits at Onakawana be that the development corporation, to the extent possible,*

RECOMMENDATION #14 CONT'D

provide employment to persons who are resident in the region and that relevant training programs be undertaken to approximately upgrade the skills and employability of persons resident in the region.

* * * *

NO PERMANENT TOWN

The Task Force is of the view that an effort should be made to avoid the creation of a new "permanent" community particularly considering the anticipation that the useful life of the lignite deposit will be only some 30 years. During the construction phase workers will be resident on the site but this should be a temporary expedient.

RECOMMENDATION #15

That a new, "permanent" community not be created during the operations period of the mine and thermal-electric generation station and workers be provided with a work schedule and with transportation of a speed, reliability and cost that enables them to travel from their existing communities.

* * * *

A DEVELOPMENT PLAN

The economic impact statement, which appears later in this report, confirms that a large number of job opportunities for which local people are qualified will become available if this development proceeds. Some of these will be specific to the development and some will be construction and services related to the development.

At present a number of studies are underway which bear upon assessment of the natural and social resources of the Lower James Bay Area. It would seem particularly important that the possible development of the Onakawana deposits be integrated into any overall development plans for the region.

RECOMMENDATION #16

That any development at Onakawana be integrated into an overall development plan for the area.

* * * *

PUBLIC HEARING PRECEDENT

This Task Force has concluded that the prime justification for the development of the lignite deposits at Onakawana is to improve the economic base of the area and the standard of living of the persons living in the area. The importance and the desirability of proceeding with development relates very directly to the ability of the proposed project to serve the local people by providing employment opportunities.

The local people, in particular, should have every opportunity to express their views as data becomes more readily available. The precedent of public hearings on the development of the Onakawana lignite deposit was established by Task Force Onakawana. The Task Force feels that further public discussion of the development is desirable.

RECOMMENDATION #17

The engineering environmental impact studies produced by the developer be public information, and well advertised public hearings be held to discuss the project before the ultimate decision is made on whether or not to proceed.

* * * *

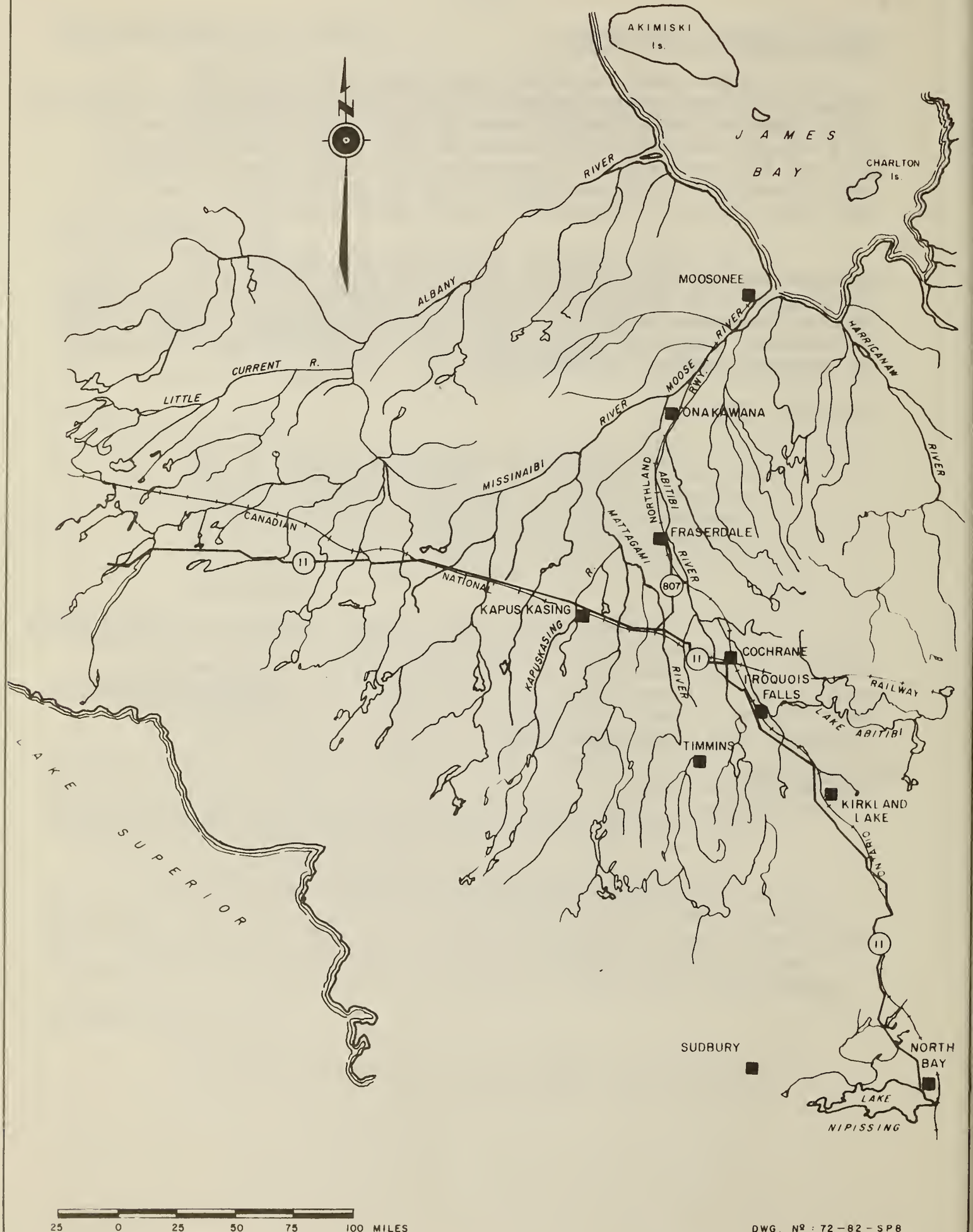
It is assumed that prior to the granting of development rights at Onakawana the development company will be required to sign an agreement as to the nature of its performance. Ontario has little experience with the strip mining of such deposits, but there is extensive experience in other parts of Canada and other countries.

RECOMMENDATION #18

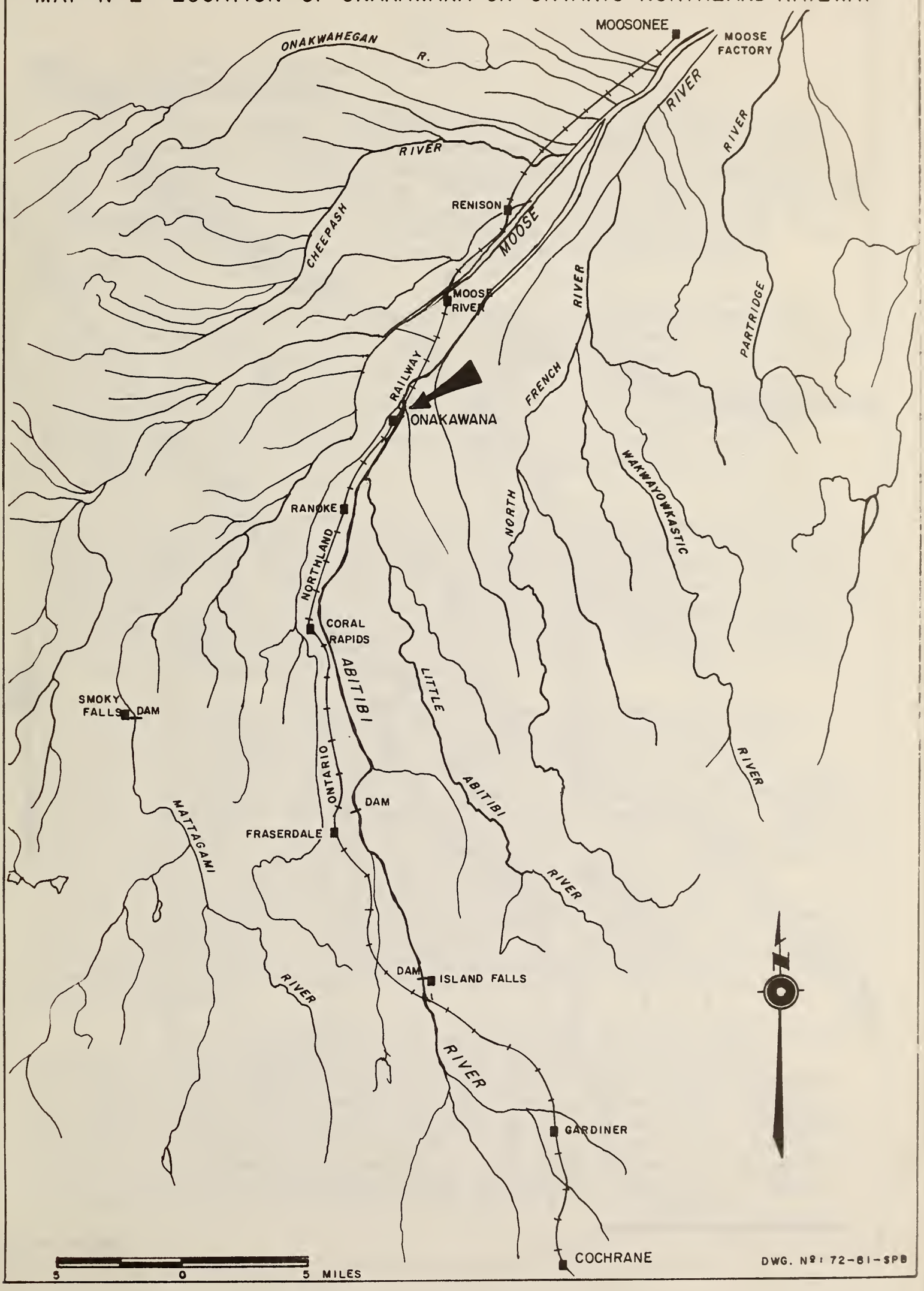
That experience in other provinces and countries be examined and that surface mining legislation in these jurisdictions be studied with the objective of improving environmental controls in Ontario.

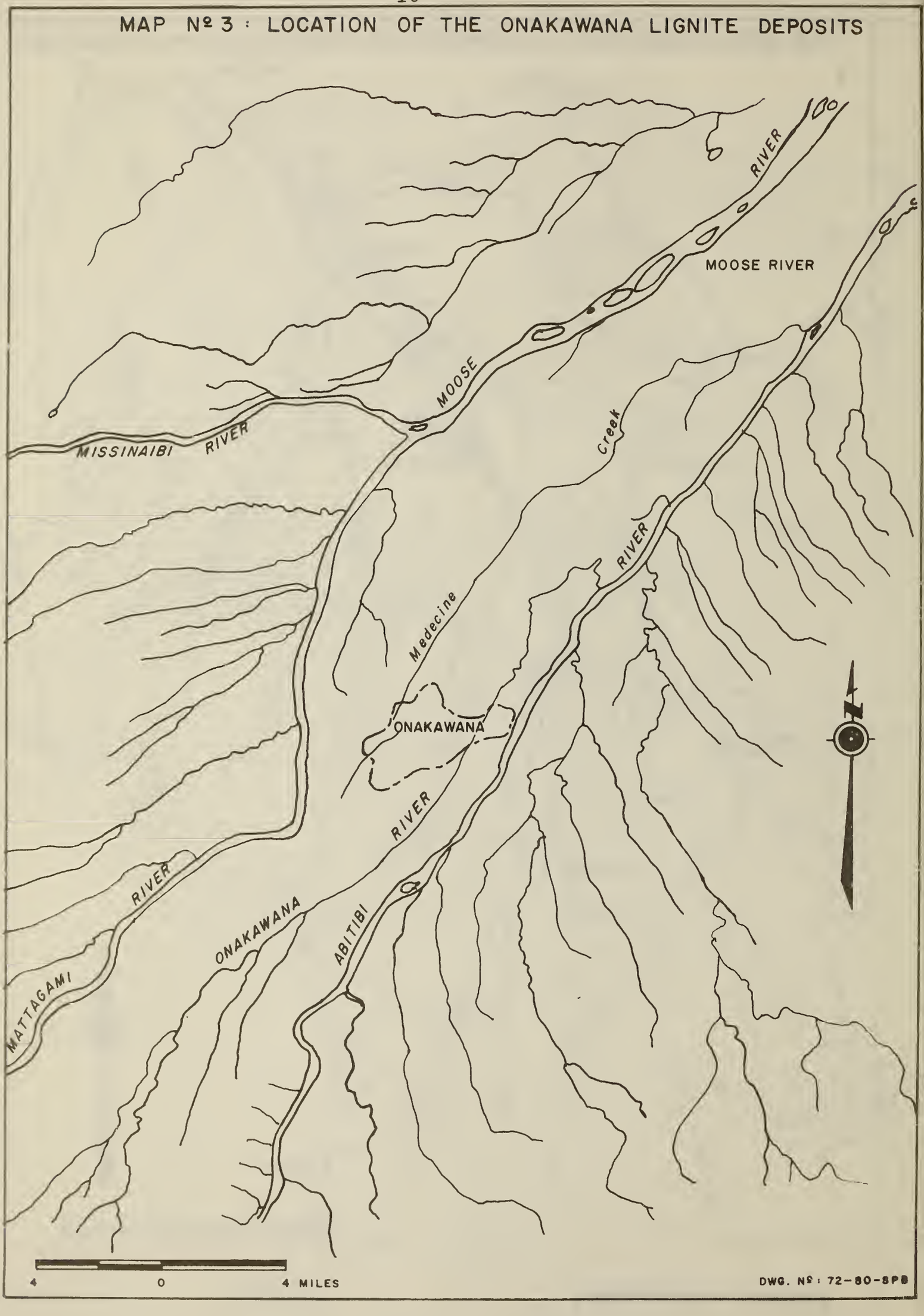
* * * *

MAP Nº 1 : LOCATION OF ONAKAWANA IN NORTHERN ONTARIO



MAP Nº 2 : LOCATION OF ONAKAWANA ON ONTARIO NORTHLAND RAILWAY




MAP Nº 3 : LOCATION OF THE ONAKAWANA LIGNITE DEPOSITS
MOOSE RIVER
MOOSE
MISSINAIBI RIVER
Creek
RIVER
Medecine
ONAKAWANA
RIVER
RIVER
ONAKAWANA
ABITIBI
MATTAGAMI
4 0 4 MILES
DWG. Nº: 72-80-8PB

SECTION II - BACKGROUND

The Onakawana lignite deposit is located in the Moose River Basin 60 miles southwest of Moosonee and 608 miles northwest of Toronto. The known deposit covers an area of approximately eight square miles starting at the west bank of the Abitibi River and extending west under the Ontario Northland Railway and the Onakawana River and reaching as far west as Medicine Creek. The Mattagami River flows two miles to the west of the western extremity of the deposit.

The presence of lignite in the Moose River Basin has been known since the earliest days of the fur traders and explorers entering through Hudson Bay. It was noted in journals prior to the middle of the 18th Century. It was officially recorded in the reports of the Geological Survey of Canada in Report of Progress in 1871. The first drilling on the site that became known as Onakawana -- previously known as Blacksmith Rapids -- was in 1885; a 4 1/2 inch hand auger was operated by personnel of the Geological Survey.

The first official notice taken by Ontario was in the Annual Report, Ontario Bureau of Mines of 1904, which recorded that the lignite was of excellent quality and projected that it would make a good fuel "for all practical purposes". In 1928 a geologist of the Bureau spent a summer on the site and reported that the deposit was quite extensive and noted that "it is the only coal deposit in Ontario so far located which gives promise of becoming commercially important".

Activity on the site coincided with the arrival in 1930 of the Ontario Northland Railway at Onakawana, en route to tidewater at Moosonee. The Ontario Department of Mines budgeted $25,000 for an exploration program and, with the funds, drilled five holes on the site. With an additional appropriation, through the agency of the Ontario Research Foundation it undertook a more extensive technical and economic study of the deposit: shafts were sunk, drifting was undertaken, samples of lignite were tested in the Mines Branch in Ottawa and the Chemical Branch of the Ontario Department of Mines and 120 tons were sealed in barrels and shipped to Germany for beneficiation tests. When, in response to the deepening of the depression, all work was stopped in 1932 it had been established that the coal had commercial possibilities and total reserves of 100 million tons had been proven.

During the summer of 1939 the Temiskaming and Northern Ontario Railway Commission announced that they were again beginning investigations into Northern Ontario lignite. Drilling and stripping was undertaken and coal was shipped to North Bay for steam drying; the resulting product was mixed with bituminous coal in the proportion of 1.25:1 for firing locomotives. The experiments proved encouraging and the decision was taken in 1942 to build a steam drying plant on site at Onakawana. Work proceeded, but in 1944 a Select Committee of the Ontario

Legislature concluded that the development of the lignite deposit was not economically sound. This was followed by a fire that damaged buildings, stock and equipment. Following repairs, work was continued until, in 1946, the firm decision was taken to terminate operations. Anticipation of a fuel shortage extended activities for a year but in the years following 1947 the plant was dismantled.

For almost 20 years the lignite field lay fallow. In 1966, through the agency of the Ontario Economic Council, the Government of Ontario proposed to the Canadian General Electric Company that a $65 million heavy water plant be constructed at Onakawana to supply 400 tons a year of deuterium oxide for use in nuclear plants. The proposal was not accepted.

Later in the same year the Alberta Coal Company was issued a three-year exploratory licence -- since extended for a further three years -- on 396 square miles that included the lignite deposits at Onakawana. By 1968 the Company had established reserves of 170 million tons. In 1968/69 the Alberta Coal Company, joint venturing with two other companies, unsuccessfully attempted to interest Ontario Hydro in buying the output of a heavy water and generating plant on the site. The current examination results from an attempt by the Alberta Coal Company -- now known as Manalta Coal Company -- to prove the economic and engineering feasibility of constructing a 900 megawatt thermal electric generating station on the site, to be fuelled with lignite from the Onakawana deposits with the resulting electric power to be sold to Ontario Hydro.

The Manalta Coal Company plan calls for the delivery of the engineering and economic feasibility study on June 30, 1973 and until this examination is complete there must be a measure of uncertainty as to the precise nature of the mine and the generating station. At the present time, assuming changes are not necessitated for reasons that emerge from the economic and engineering feasibility study, it can be expected that the operation will approximate the following:

-- The capacity of the generating station will be of the order of 900 megawatts.

-- The energy source will be lignite from the Onakawana site.

-- The thermal plant will be built on the west bank of the Abitibi River at Onakawana.

-- The Abitibi River will be the primary source of supply water for the generating plant and for cooling and other purposes.

-- The Onakawana River will be diverted upstream from the mine site and it will flow into the Abitibi River; this will involve the loss for the lifetime of the operation of the final four and a half miles of the Onakawana River.

-- The expected mine development will be by open pit involving the stripping of overburden by using a large dragline with a 300-foot boom working seven days a week, three shifts a day.

-- The lignite field will be mined from east to west in parallel north-south channels.

-- The lignite will be mined by conventional power shovel and truck at the rate of 18,000 tons per day, five days per week, for a total of approximately five million tons per year.

-- The overburden removed from each successive channel will be deposited in the channel which had been previously mined out. The resulting landscape will be a series of parallel ridges 100 feet apart and perhaps 70 feet from peak to valley on a 37 degree slope. The valleys will flood to the natural groundwater level. The peaks will be rounded off to perhaps 20 degrees resulting in a series of rounded parallel ridges 30 to 40 feet high and separated by narrow, parallel lagoons.

-- The anticipated life of the mine is approximately 30 years. As nuclear fuelled plants come on stream in the Ontario Hydro system the Onakawana thermal plant might be operated at less than full capacity and this would have the effect of extending the life of the lignite body.

-- Assuming that electrical energy can be produced at competitive rates and agreement is reached with Ontario Hydro to buy the output -- which is crucial in terms of deciding whether development will proceed -- the power will be required in 1981/82 and, because it will require five years to construct the plant, construction will begin in 1976.

-- The number of workers required during the construction of the thermal generating station will be 400 at the end of the first year, 1,300 at the end of the second year, 1,450 at the end of the third year, 800 at the end of the fourth year and 50 at the end of the fifth year.

-- The maximum number of workers required for the development of the mine itself will be of the order to 50 to 75.

-- The operation of the thermal plant will require of the order of 150 persons and the operation of the mine 250 persons.

-- A construction camp will be established at Onakawana with a network of roads connecting the camp to the mine and the generating station. During the construction phase it is assumed that workers will be billeted at Onakawana.

-- It is the view of Manalta Coal Company that there would be measurable advantages in housing the permanent operating staff in established communities and arranging to transport them to the work site at Onakawana, thus avoiding the necessity of creating a 30-year community at Onakawana.

-- The licence of occupation, originally granted for three years and extended once, will lapse at the end of 1972 and it is assumed will be extended for a further three years from January 1, 1973.

-- The company has a right to apply for and receive a 21-year, renewable mining lease provided it undertakes to begin construction of a suitable mine within two years and to have such mine in operation within four years of the commencement of the lease.

-- The mining lease will consist of not more than 20 square miles and will be at an annual rental of approximately $1.00 an acre. A royalty payment for all lignite recovered shall be payable at the end of each year and a figure of 10 cents a ton is assumed.

-- It is considered probable that any environmental requirements and performance standards will be negotiated with the company and will be written into the mining lease and will become an integral part of that lease.

It bears repetition that the engineering and economic feasibility study has not yet been completed and that the outline above must, to a degree, continue to be tentative. Because some of the environmental considerations may have a measurable impact on the economic feasibility of the proposed operation it is imperative that the environmental concerns of the Government of Ontario should be expressed before investment decisions, which may be influenced by these concerns, are taken. The concerns should be recorded and amelioration costs should be built into the feasibility study.

Task Force Onakawana is proceeding with approximate data and is arriving at preliminary conclusions as to the environmental impact prior to firm decisions as to the mode of

operation at the mine and plant. Because the conclusions of Task Force Onakawana cannot be precise in the absence of a final statement as to the procedures at Onakawana, the Task Force must express conditional conclusions and this implies that when the engineering feasibility is completed and the precise procedures are known the Government of Ontario should re-examine the concerns that relate to the environment.

It will be recommended that the Ministry of the Environment should be charged with the responsibility of examining the final plans of the Manalta Coal Company, subsequent to the completion of the final economic and engineering feasibility study, and assuring that there are not changes in the operating plans and procedures that were not anticipated at the time of the preparation of this preliminary report that could have a deleterious impact on the environment.

SECTION III - PHYSICAL AND CLIMATIC BACKGROUND

1.1 CLIMATE

The climate of northern Onatario may be classified as modified continental with the modification being due to the presence of the Great Lakes on the south and Hudson Bay on the north. As a consequence spring comes late in comparison to a similar latitude in the Prairie Provinces (where the climate is continental). A pattern of relatively low winter and high summer precipitation prevails. Cold polar air masses producing dry clear weather persist a greater portion of the time than in southern Ontario, especially in the winter. In summer a continuing succession of cyclonic storms sweep over the area and warm, humid air masses of the south alternate with cooler and drier air from the north to give two or three days of fine weather followed by warmer, more humid weather, often with a day or two of changeable winds and rain.

Moosonee lies in the Albany climatic region and Cochrane lies in the Northern Clay Belt climatic region with the regional border being an east-west line approximately midway between these two communities. The lignite field lies in the southern portion of the Albany region. Based on extrapolation of information from Moosonee, Cochrane, Smoky Falls and Abitibi Canyon the Onakawana area can be said to have approximately the following climate:

i) mean annual precipitation: 31 inches
ii) mean precipitation (May - October): 19 inches
iii) mean annual snowfall: 100-110 inches
iv) length of growing season: 140-145 days
v) mean annual frost free period: about 80 days
vi) degrees days (1) (42°F): 1750 - 1850

2.1 GEOLOGY

Any geological assessment of the environment must be based on a knowledge of the bedrock, surficial deposits, landscape and drainage pattern.

2.11 BEDROCK

Except for a few small, isolated outcrops along river courses, the bedrock of the Onakawana region is obscured by glacial and post-glacial deposits. Direct knowledge of the solid geology comes principally from the extensive drilling programme of the Ontario Department of Mines.

(1) Degree-day: The algebraic sum of the differences between the mean temperature of each day and 42°.

The oldest rocks proven by drilling are Precambrian gneisses, granites and syenites that, at Onakawana, lie at a depth of 1,027 feet. There is evidence that the rocks underwent weathering before an extensive erosional interval levelled them down to a peneplain-like surface that was ultimately invaded by Paleozoic seas. This marine episode produced Ordovician and Silurian rocks elsewhere around Hudson Bay but at Onakawana they are absent. It is possible that they were never deposited there or, if they were deposited, they were eroded away in an interval of continental conditions after the Silurian Period. This interval was followed by a second marine transgression that laid down the Middle and Upper Devonian rocks that overlie the Precambrian at Onakawana. A gradual change to terrestrial conditions again produced a continental margin environment by Lower Cretaceous time and in this environment, probably in brackish-water swamps, there was deposition of the lignite that constitutes the principal geological potential in the area.

The Lower Cretaceous rocks are truncated by an erosional surface which is overlain by unconsolidated deposits and has an irregular topography. The average depth to bedrock is roughly 70 feet.

2.12 SURFICIAL DEPOSITS

The weathered Cretaceous rocks were eventually covered by Pleistocene ice that left at least three till sheets in the region, with the upper two separated by interglacial deposits, marking a warm climate period between ice advances. The superincumbent load of ice depressed the land surface to below sea level so that when the ice finally disappeared, about 7,000-8,000 years ago, an arm of the sea invaded the area, producing an early and more extensive form of Hudson Bay: in older reports this is referred to as the Champlain Sea, though recently the name Tyrrell Sea has been adopted. This body of water deposited marine clays and silts which have since been exposed above water by the gradual isostatic rebound of the land after the ice melted. Sparse modern soils and muskeg are developed on this deposit.

2.13 LANDSCAPE

The flat bed of the Tyrrell Sea, which has been emerging from the waters of Hudson Bay for thousands of years, is still emerging. This process has produced an essentially planar surface with comparatively little relief except in the vicinity of raised shore lines (none of which cross the Onakawana lignite field) and to a slight extent along river valleys, where there is evidence of terracing. One such terrace at Onakawana, on the west bank of the Abitibi River, provides an obvious site for camp and plant installation.

The flat land surface at Onakawana is part of a larger plain that slopes gradually down to the shore of James Bay at a gradient averaging between two and three feet per mile.

2.14 DRAINAGE

Three factors contribute to the poor drainage of this area. Firstly, the land surface is newly emergent from the sea and has had comparatively little time to develop an efficient drainage pattern. Secondly, a factor intimately connected with the first, there is a general lack of any significant relief other than in the immediate vicinity of river banks, which would aid drainage. Both of these factors account for the generally parallel drainage schemes of the Abitibi, Moose and Onakawana Rivers, as well as their shallow gradients which, in the case of the Abitibi, is 3.4 feet per mile.

A final determinant is the nature of the surficial deposits, which are compact, dense and of weak structure. The free passage of water is impeded. The surface expression of this is the predominantly swampy, moss covered ground between the rivers.

2.2 SOILS

2.21 DESCRIPTION AND ANALYSIS

In many respects the soils of the region around Onakawana are remarkably alike. In general, the uppermost mineral deposits are stone-free, silty clay loams overlain by moderately well decomposed organic materials.

The organic deposit is of uniform thickness varying from three to four over the whole of the region. The only exception to this occurs within 300 feet of the Abitibi River where the organic materials are about 14 inches thick.

The organic deposit is black when wet, turning brown on drying and originates from woody materials. The fiber content varies from 32 to 36 per cent which, according to the Canada Soil Survey Committee (1970), places this in a group of organic soils called mesisols. Although inferior to mineral soils as a growth medium these are considered to provide the best medium for plant growth of all organic soils as water control is somewhat easier in them than in organic soils of more or less decomposition. The organic materials with pH of about 5.0 are more acidic than the underlying mineral strata.

The mineral strata underlying the muskeg blanket vary in thickness and composition. The most complete information about their thicknesses and extent can be gained from the records of the many drill holes. In general the muskeg is underlain by five to seven feet of material which, although frequently called marine clay, is not really a clay in texture. Instead it varies in texture from silty clay loam to silt loam with clay contents of about 10 to 30 percent. Of greatest significance is the high silt content, which may reach 80 percent.

2.14 DRAINAGE

Three factors contribute to the poor drainage of this area. Firstly, the land surface is newly emergent from the sea and has had comparatively little time to develop an efficient drainage pattern. Secondly, a factor intimately connected with the first, there is a general lack of any significant relief other than in the immediate vicinity of river banks, which would aid drainage. Both of these factors account for the generally parallel drainage schemes of the Abitibi, Moose and Onakawana Rivers, as well as their shallow gradients which, in the case of the Abitibi, is 3.4 feet per mile.

A final determinant is the nature of the surficial deposits, which are compact, dense and of weak structure. The free passage of water is impeded. The surface expression of this is the predominantly swampy, moss covered ground between the rivers.

2.2 SOILS

2.21 DESCRIPTION AND ANALYSIS

In many respects the soils of the region around Onakawana are remarkably alike. In general, the uppermost mineral deposits are stone-free, silty clay loams overlain by moderately well decomposed organic materials.

The organic deposit is of uniform thickness varying from three to four over the whole of the region. The only exception to this occurs within 300 feet of the Abitibi River where the organic materials are about 14 inches thick.

The organic deposit is black when wet, turning brown on drying and originates from woody materials. The fiber content varies from 32 to 36 per cent which, according to the Canada Soil Survey Committee (1970), places this in a group of organic soils called mesisols. Although inferior to mineral soils as a growth medium these are considered to provide the best medium for plant growth of all organic soils as water control is somewhat easier in them than in organic soils of more or less decomposition. The organic materials with pH of about 5.0 are more acidic than the underlying mineral strata.

The mineral strata underlying the muskeg blanket vary in thickness and composition. The most complete information about their thicknesses and extent can be gained from the records of the many drill holes. In general the muskeg is underlain by five to seven feet of material which, although frequently called marine clay, is not really a clay in texture. Instead it varies in texture from silty clay loam to silt loam with clay contents of about 10 to 30 percent. Of greatest significance is the high silt content, which may reach 80 percent.

Silt-size particles are easily eroded by both wind and water and do not provide a good base for such structures as buildings and roads. Frost boils are difficult to control in silty materials that are saturated most of the time.

Boulder "clay" (glacial till) underlies the marine clay and, as in the case of the marine clays, the thickness of the deposit varies. Drill holes confirm thicknesses ranging from 12 to 110 feet. The boulder clays actually contain little clay (often less than 10%) compared to the amounts of sand and silt. The sand content is close to 50% and the silt content is commonly more than 30%. In spite of the numerous small stones and pebbles and the high sand content the boulder clay has been preconsolidated to an extremely high bulk density of about 2.20.

Significantly, sand and gravel strata of variable thicknesses are present in lenses or layers at various depths. These layers may be of use for construction in the area.

The mineral materials have a much higher reaction than the muskeg. The marine deposits and the boulder "clays" are often weakly calcareous with a pH of about 7.7 to 7.9 and a $CaCO_3$ equivalent of 10-20%. Brief descriptions of the two major soil profiles follow:

#1 - TYPICAL OF MOST OF THE AREA

O_1 - 0" to 10" O_2 - 10" to 30"	pale brown, dominantly sphagnum, pH 4.5. black when wet, brown when dry; moderately well decomposed (mesic); fibre content 34% derived mainly from wood; pH 5.0.
11C - 30" to 34"	dark gray silty clay loam; weak medium blocky structure; firm consistence when moist; hard when dry; stone-free; pH 6.6.
111C -34" +	gray silt loam; weak prismatic structure; firm when moist, hard when dry; stone-free; pH 6.8.

#2 - CLOSE TO ABITIBI RIVER

0 - 0 - 14"	brown when dry, black when wet; moderately well decomposed (mesic) fibre content 31%; derived mainly from wood; pH 5.2.
11C -14" to 18"	pale brown sandy clay loam; sticky when moist, very hard when dry; weak prismatic structure; pH 6.4.
111C -18" to 26"	brown sandy clay; mottled; sticky when moist, very hard when dry; weak coarse blocky structure; stone-free; pH 6.7.

IVC - 26" + brown medium sand; loose, structureless; stone-free; pH 6.7.

The profile #2 soil type occurs close to the bank of the Abitibi River whereas profile #1 is typical of the remainder of the area. The sandy materials deposited along the river bank are underlain by the boulder "clay" at comparatively shallow depths.

2.22 SOIL TEMPERATURES

Low soil temperatures are a major cause of the slow growth in the region, as compared with other saturated soils. In order to gain some measure of soil temperatures simple thermometer readings were taken in August from different locations at a depth of two feet.

In the open areas of muskeg the temperatures recorded averaged 7°C whereas in wooded areas the average temperatures were 3.5°C. Temperatures of mineral materials ranged from 7 to 11°C depending on the drainage. The wet places had the lowest temperatures.

2.23 SITE DRAINAGE

Soils are described as being well, imperfectly, or poorly drained. Well drained soils are those that are saturated less than six months of the year while poorly drained soils are wet or saturated for more than nine months.

The entire region, with the exception of areas immediately adjacent to the rivers, are poorly drained and contain a high watertable throughout the year. The high bulk density of the marine silts underlying the muskeg restrict downward movement of water and this results in a "perched" watertable forming above this layer. The low relief over much of the area inhibits lateral water movement within the organic deposits and consequently surface drainage is poor.

SECTION IV - DEVELOPMENT PROBLEMS RELATED TO SOILS

3.1 REMOVAL AND STOCKPILING OF MUSKEG

Because of poor site drainage surface drainage of the entire area will be required. In addition it would be desirable to remove and stockpile the organic materials prior to development as organic materials have poor structural properties and are not good for backfilling purposes in mined-over areas and, further, if mixed with the surface soils will contribute to post-site reclamation.

Care must be taken to prevent complete drying of the organic material during stockpiling as, once dry, it resists the absorption of water. More importantly, it becomes highly combustible and subject to wind erosion.

3.2 EROSION

The extensive slopes of stockpiled overburden and coal spoils associated with a strip mining operation of the Onakawana type are generally denuded of vegetation and are exposed to the full action of wind and rain. These erosive forces will cause a significant increase in sediment loads of local stream systems unless precautions are taken. Work conducted in the United States has shown that sediment yield from the strip mined portions of a watershed may be 10 to 1,500 times that of undisturbed land.

Erosion takes place as sheet erosion and as gullying. Sheet erosion occurs with each rainfall because of displacement of soil particles by individual raindrops. It occurs over the entire landscape and the magnitude of its effect is proportional to the area exposed. Gullying develops on slopes where water flow is concentrated into small channels or streams. Hazards associated with gullying are usually greater as slope is increased.

Road construction, in particular, can create severe erosional problems as a result of disturbance and interference with natural drainage patterns. Frequently roads concentrate surface drainage at low points along them and this can lead to gullying.

Erosion at the Onakawana site can be expected to result from the following activities:

1. stockpiling overburden
2. road construction
3. stockpiling coal
4. pumping for control of mine drainage
5. surface drainage of the area
6. stream diversion

The marine silts will present the greatest problem in erosional control on the site. Silt textured soils and sediments are the materials that are the most susceptible to erosion and protective measures in the form of sediment ponds and revegetation will be required during the initial stages of development where the removal of organic material during stockpiling results in exposure of the silt materials.

Erosion due to frost action during the spring months may be exceptionally high. As thawing occurs in the spring, a saturated zone of soil will form above the frost layer and this could lead to movement of soil downslope, especially on slopes exceeding 15-20%.

There is no way of combatting erosions that is superior to keeping the area of disturbed, unvegetated land to a minimum: this implies preplanning and rapid reclamation. It is imperative that drainage control and sedimentation basins be installed prior to development and used until revegetation is complete.

Methods for erosion control include terracing stockpiled overburden, intercepting carried material with sediment ponds and well planned revegetation programs.

3.3 SLOPE STABILITY

With the exception of the initial excavation it is assumed that the strip mining operation involves removal of the overburden and use of this material to backfill those areas in which mining has been completed. The overburden dump for the initial excavation site should be terraced and revegetation of the slopes should begin as soon as possible. Surface drainage of the terraces is also requried. Stockpiling of overburden directly on the organic materials or use of organic material in backfilling should be avoided if practicable. Care should also be exercised in stockpiling the marine silts since such materials have a narrow plastic index and, when saturated, are susceptible to slumping and sliding. Boulder clay should be suitable material for backfilling, road construction, etc. Montmorillonite-type minerals are absent in the marine silts and boulder clay, minimizing slope stability problems and accelerated erosion problems associated with expanding clays and, in addition, these materials contain the equivalent of 10% to 20% calcium carbonate which means the clay is flocculated and less susceptible to dispersion and movement.

Precipitation data for Abitibi Canyon indicate that on the average the months of June, July, August and September receive over three inches of rainfall per month -- about one-half of the yearly precipitation. During the spring thaw a saturated zone of soil will form above the frost line. Problems with mass movement of materials downslope can result unless suitable precautions are taken.

3.4 LEACHATE PROBLEMS

The Onakawana lignites are dark brown to black, woody and earthy deposits comprised of flattened stem material with an interstitial, fine grained detritus. It contains 50% or more of water. A major problem encountered in working lignite and coal deposits can arise out of the occurrence of pyrite which can result in a low pH which kills off the flora and fauna. The Onakawana lignite was checked for pyrite and none was found. This is confirmed by chemical analyses from the Department of Energy, Mines and Resources, which show sulphur content to be very low. The lignite itself would not produce a significant acidifying effect on the environment but this much cannot be said of the associated Cretaceous clays since samples were not provided for study: it is conceivable that they may be pyritiferous as, in fact, shale beds in the underlying Devonian are known to be. It would be a logical precaution to investigate the possibility of pyrite occuring in those Cretaceous beds that will be stripped with the lignite and exposed to oxidation at the surface.

Two water samples were brought back to the University of Guelph for analysis: the water from the lower lignite seam proved to be less acid than the water in the organic material.

The analysis of water from lignite in Table 1 gives concentrations of common plant nutrients released into the water. The alkalis and magnesium are particularly high in comparison to their values in muskeg water and if the water were impounded in settling ponds, the nutrients might stimulate algal growth.

If it is assumed that the coal is being stockpiled at Onakawana the limited amount of leachate that would result could be handled in a number of ways. The use of calcareous boulder clay as a base to the stockpiles, for example, would allow any leachate to percolate down through the calcareous materials and the free $CaCO_2$ would neutralize any acid present in the leachate and would flocculate out any colloidal-size organic material in suspension.

Decomposed organic matter from the stockpiled organic deposits will eventually reach the drainage ways via erosion. Hence the importance of preplanning work in the area; catchment ponds should be located so as to intercept all runoff from surface drainage, pumping operations at the mine site and natural runoff that would enter the streams from the construction site. The catchment ponds should be designed to allow the settlement of the heavy silts and sand.

TABLE 1 Analyses of two samples of water from the Onakawana area.

Trace elements in ppm (mg/litre)

		A. Muskeg water	B. Sample from lower lignite bed
pH		6.3	7.2
Potassium	(K)	0.8	6.5
Sodium	(Na)	0.2	18.2
Calcium	(Ca)	22.1	16.6
Magnesium	(Mg)	23.5	109.6
Iron	(Fe)	1.0	0.2
Nitrogen	(N)	0.0	0.8
Phosphorus	(P)	0.1	0.3

3.5 PUMPING OF MINE OR DRAINAGE WATERS

Pumping can be expected to cause erosion and deterioration of water quality. The problems arising from erosion, which evidences itself in the siltation of stream beds, etc., can be overcome by sediment ponds. There is, however, some cause for concern that pumping of water which has been in contact with the coal could lead to the discoloration of water in streams; finely divided, suspended coal particles could persist.

To test the persistence of suspended materials 50 gram samples of coal were shaken in a litre of de-ionized water (5% suspension) for about 12 hours; after being allowed to stand undisturbed for two weeks the supernatant in the sedimentation cylinders remained cloudy and no apparent settling of particles or clearing of the suspension had occurred. Further, this material does not settle out of suspension by centrifugation of 1200 x gravity. It can, however, be flocculated out of suspension by using any common electrolyte such as calcium chloride, sodium chloride, etc. The addition of some sort of flocculating agent in the sedimentation ponds would prevent such material from reaching the streams and rivers.

Because of the pH level (6.0-7.0) and $CaCO_3$ content of the sediments in the area, the solubilities of inorganic ions, such as iron and manganese, are negligible and, if released, would be oxidized and precipitated rapidly. The concentrations of these elements are such that no iron or manganese problem is anticipated.

3.6 HEAVY METAL CONTAMINATION

Heavy metals constitute a further environmental hazard that might be encountered. Coals and their seat earths -- fireclay -- are to some extent notorious as sources of high trace element concentrations. Mercury, zinc, cadmium, germanium and selenium, for example, may be present in abnormal amounts. Some circumstantial evidence that this possibility is worth investigating is provided by Dr. D. C. Jordan of the University of Guelph whose preliminary analyses suggest that fish caught in the Abitibi River below Onakawana may have unusually high selenium in their tissues. This may or may not be attributable to Cretaceous rocks.

3.7 DISPOSAL OF ASH MATERIALS

Methods used for disposal of the ash materials will depend on the plant operations. If the ash material is disposed of in the form of a slurry holding ponds will be required to prevent thermal and sediment pollution of the streams. Indeed, some operations recycle the cooled water from these ponds.

Use of the ash will depend on its physical and chemical properties. On one hand it may be allowed to gradually fill the holding ponds or, alternatively, if it is coarse textured, sintered material, it could be incorporated and mixed with the surface soils to provide a porous, well structured medium for revegetation purposes.

Further work on the properties of the ash and ratio of soil-ash mixtures will be required if the latter alternative is entertained.

3.8 SITE REHABILITATION

The mineral materials taken from the pit should be piled at least five feet above the existing land surface to provide some relief to the area for site drainage. This will result in a lack of material to refill part of the mined over area but an after-use plan could include the establishment of artificial lakes. All of the mined area should be partially levelled. Agricultural experience has shown that a 6% slope results in virtually no erosion, thus allowing the most rapid possible revegetation. As the slope increases from 6% to 27% the amount of erosion also increases. Further investigation to determine the practical limits as to the optimum degree of slope at Onakawana will have to be undertaken.

Ideally the top three to five feet of soil should consist of the interglacial sand and gravels or the boulder "clay" mixed with muskeg material. The former may be preferred to the latter since the boulder clay has been preconsolidated to a high bulk density and may not break down easily. Such mixing will improve soil structure and soil moisture relationships and improve plant growth. The surface of the soil should not be compacted prior to seeding or revegetation; a loose friable surface should ensure good stand establishment.

It appears that the overburden will be favourable for tree growth. Lime will not be needed because the spoil is calcareous. Fertility levels are sufficiently high for tree growth although an initial application of nitrogen fertilizer may be beneficial. Use of legumes as a nurse crop may prove sufficient.

Revegetation of the area should proceed in two stages:

(i) Quick establishment of a ground cover of grasses or legumes to control erosion and act as a nurse crop for secondary vegetation.

(ii) A revegetation oriented toward establishing those species that best meet the land use objectives of the reclamation plan.

The first stage should begin once suitable areas are ready; the second stage of revegetation will take several years for completion.

The acidity of the spoil piles is usually considered to be the single most important factor affecting plant survival and growth. However, in the present situation, it is unlikely that acid problems will arise due to the low sulphur content of the coal and the high pH of the water associated with the coal.

The environment for plant growth can be improved as a result of the mining operation. Poor vegetation growth reflects climatic conditions but a more important cause is the continually saturated conditions of the organic soils. Plant growth will be improved by drainage and by providing a good mineral soil as the rooting medium. A broader range of tree species may grow because of the improved conditions.

The success of revegetation programs should not be compared directly to successes on strip mined areas in Saskatchewan and Alberta; although the winter climates of the prairies may be as harsh or harsher than at Onakawana, their summer conditions are more favourable for plant growth. Comparison of degree-days is a better indicator of growth conditions than the length of growing season and temperature, and, in this context, the following table is relevant:

(i) Estevan, Saskatchewan: 2,500 to 3,000 degree-days.

(ii) Edmonton, Alberta: 2,000 to 2,250 degree-days.

(iii) Onakawana (estimated): 1,700 to 1,850 degree-days.

3.9 DISPOSAL OF SEWAGE EFFLUENT

With the exception of those areas immediately adjacent to rivers and streams the entire area is covered by two to five feet of organic material overlying marine silts. The muskeg is poorly drained and the watertable is at or within 12 inches of the soil surface throughout the year. Consequently, these soils are not suitable for disposal of sewage effluent by septic tank or spray irrigation. Ontario Ministry of Health regulations require approximately five to seven feet of well drained soil. Materials exist in the overburden that could be used to prepare a septic tank field.

CONCLUSIONS

4.1 ACID LEACHATE should not be a problem due to the pH of the coal-leachate and of water associated with the coal beds. Further, the marine silts and boulder "clays" which are the major sediments overlying the coal are calcareous and these will serve to neutralize any acid materials. The Cretaceous fireclays, however, should be checked for pyrite or heavy metals concentrations.

4.2 SURFACE DRAINAGE of the area will be required prior to development, as well as stockpiling of the surficial organic materials. This will lead to increased erosion on the site which can be controlled by proper planning and installation of sedimentation ponds. An initial plan for post-drainage of the area is, therefore, required.

4.3 EROSION will increase as a result of the strip mining operations but its effects can be minimized or reduced to negligible levels by such erosion-control measures as sedimentation ponds and revegetation programs. The sedimentation ponds should be inspected at regular intervals for performance. Roads should be planned and constructed so as to minimize the effect of road construction on stream systems; construction on steep slopes should be held to the essential minimum.

4.4 PROBLEMS OF SLOPE STABILITY may be minimized by reducing the effective slope of spoil piles and by initiating as rapidly as possible revegetation of the slopes. A problem that could arise on steep slopes is mass slope movement due to saturated moisture conditions which may prevail in the early spring and summer periods. Care must be taken in stockpiling the marine silt materials since they are particularly susceptible to slumping under saturated conditions. To ensure that the waste slopes can be revegetated satisfactorily the grade slopes should be kept to a minimum, the tops of terraces should be graded inward to discourage surface runoff and, if possible, the tops of terraces should incorporate the recommended topsoil mixture in the final grading.

4.5 WATER DISCOLORATION may arise because of pumping on the mine site. Sediment holding ponds will not overcome this problem but the finely divided coal particles can be flocculated out of suspension by the addition of an electrolyte.

4.6 PLANNING is the key to success of all control measures. With proper planning, many deleterious effects can be prevented, and others remedied with much less expenditure of time, effort and capital. Further, if the costs of environmental repair are estimated in the feasibility study they are budgeted as part of the cost of mine development and operation and do not subsequently arise as an unbudgeted cost.

4.7 SITE IMPROVEMENT to enhance the ability to grow plants, relative to conditions now existing at Onakawana, can be achieved following the strip mining operation. Contour grading to provide the area with surface drainage and mixing of the muskeg or other material with the mineral soil to provide a suitable rooting medium will contribute to this improvement.

4.8 EXPERIENCE in Saskatchewan and Alberta should be exploited; lignite deposits have been mined in these provinces for decades and close communication at the Ministry level should result in the avoidance of unfortunate experiences.

SECTION V - WATER RESOURCES

A. SURFACE WATER

5.1 ASSESSMENT PROCEDURE

The area is drained by three rivers, of which the Abitibi River is the largest. The Abitibi River drains 10,600 square miles, the Onakawana about 316 square miles, and Medicine Creek about four square miles at Onakawana.

The Mattagami River, which at Onakawana flows about five miles to the west of the Abitibi River, has a drainage area in excess of 14,000 square miles above the Onakawana area.

Streamflow analyses consisted of the preparation of duration hydrographs, showing traces of the maximum, median and minimum seven-day mean discharges throughout the calendar year as well as flow duration and low-flow frequency curves for the selected locations. These curves emphasize the variability in flow distribution within the selected period of record.

Duration curve data of seven-day mean discharges were determined for each of 52 specified seven-day periods in a year utilizing daily streamflows for the period of record. (A flow duration curve is a cumulative frequency curve that shows the percentage of time specified streamflows are equalled or exceeded during a given period). Traces of the maximum, median and minimum seven-day mean discharges were prepared to show the magnitiude and range of flows over the selected period of record for these 52 seven-day periods. Duration curves of daily flows were prepared for the Mattagami River at Smoky Falls and Little Long Rapids and the Moose River at Moose River Crossing and duration curves of both daily and seven-day moving average flows were prepared for the Abitibi River at Onakawana.

Low flow frequency analyses were done and frequency curves were prepared for the summer-fall, winter and annual periods. A distinction was made between the summer-fall and the winter periods as the flows during these periods are generated under widely varying hydrologic conditions. Also greater demands are generally placed on the water resources of a river during the summer-fall or open water period than during the winter when severe freezing conditions prevail. Further, when a river is being considered or used as a source of cooling water, such as for a thermal electric power station, the background temperature of the river water during the open water, low flow period is an important constraint on the permissible heat input into the river from such a thermal station. In most situations the highest background water temperatures coincide with the lowest river flows during the summer-fall period.

For this study the summer-fall period was arbitrarily taken as May 1 to October 31 and the winter period as November 1, to April 30. Control dams and hydro-electric power stations have been built on both the Abitibi and Mattagami rivers upstream from the Onakawana area. Regulation of river flows at these sites have adversely affected the dependable downstream low flows for up to two consecutive days. The Abitibi River is often completely turned off upstream from Onakawana and, even though the effects of such regulation become more and more muted at downstream gauging locations due to additional inflow into the river, the changes are still very large. The adverse effects of regulation on the Mattagami River are not as pronounced as on the Abitibi.

The frequency curves of the lowest one-day average flows of the Abitibi River at Onakawana and the Mattagami River at Little Long Rapids reflect the severe flow reduction related to this upstream regulation. In order to arrive at a better appreciation of the dependable water resource potential of the Abitibi River at Onakawana, a duration curve of seven-day moving average flows was prepared. It was found that the minimum seven-day average flow was 4,500 cfs. This confirms that regulation at Onakawana could ensure a much higher flow of water than the minimum one-day average flow of 700 cfs.

5.2 WITHDRAWAL OF WATER

The evaluation near the Onakawana area confirms that at certain times of the year the Abitibi and Mattagami rivers cannot be used as a source of withdrawal of some 800 cfs of water on a continuous basis: both rivers have experienced mean daily flows less than the estimated flow requirements for cooling water purposes. On an annual basis there is a 10 percent probability that the minimum one-day average flow of the Abitibi River at Onakawana and the Mattagami River at Little Long Rapids will be less than 700 and 300 cfs, respectively. There is a 20 percent probability that the one-day average flow of these rivers will be less than 1,000 and 700 cfs, respectively.

The minimum seven-day average flow is much better. There is a 10 percent probability that the minimum seven-day average flow of the Abitibi and Mattagami rivers at the previously defined location will be less than 4,200 and 3,700 cfs, respectively. Similar values at the 20 percent probability level are 5,000 and 3,900 cfs, respectively.

Different operating procedures at upstream river flow control works or the construction of a buffer reservoir downstream of these works or a combination of both these means would improve short term minimum flow conditions and make the rivers more reliable as a source of water for use on a continuous basis.

5.3 RETURN OF COOLING WATER

Using the river as a source for withdrawing cooling water for a thermal-electric generating station of 900 megawatts would require a dependable flow in excess of 800 cfs; if this cooling water is to be returned to the stream a much larger flow would be required if maximum river temperatures commensurate with the present aquatic ecosystem are to be maintained.

Aquatic ecologists will have to determine what temperature rise would be acceptable under extreme and under average conditions and determine the flow ranges that will be required to meet acceptable standards. Engineering studies can then be initiated to study the feasibility of providing the recommended flow ranges and at what cost.

B. IMPACT ON GROUND WATER RESOURCES

6.1 EFFECT OF WASTE DISPOSAL

Large amounts of liquid and solid wastes will be produced as a result of the mining and burning of the lignite as a fuel at the proposed thermal electric generating station. Disposal and storage of the wastes on the ground surface is not expected to have significant effects on the temperature and quality of the ground water near the sites because of the relatively impermeable nature of the surficial deposits.

6.2 EFFECT ON GROUND WATER FLOW SYSTEMS AND PRODUCTIVITY OF AQUIFERS

Development of the lignite will disturb the geologic formations of the area. The general effect will be a dewatering of aquifers in the immediate area of the mine. Present knowledge indicates that the ground water flow system in formations overlying the Devonian bedrock is local in nature and the productivity of the sand and gravel aquifer is small.

Because of the generally low permeability of the formations, the extent of dewatering should be localized. The effect on the entire flow system is expected to be local and the loss of ground water resources due to lignite development will likely be small.

6.3 EFFECT OF GROUND WATER DISPOSAL ON SURFACE WATERS

Ground water will have to be pumped out during mining operations. Total dissolved solids content of ground waters in the overburden and the lignite beds is less than 600 ppm. No chemical quality problem can be foreseen by introducing these ground waters to streams. Any suspension load of powdered lignite in the water, however, would blacken water if the water is pumped directly into the stream and it would be necessary to use settling ponds and, perhaps, a flocculating agent, to remove the suspended lignite from the water.

6.4 CONCLUSION

The impact of lignite development on ground water resources is expected to be limited. More detailed field studies on the hydraulic properties of the formations would shed light on the effects of the dewatering program.

C. SUMMARY OF ANTICIPATED IMPACT ON AQUATIC RESOURCE

7.1 THERMAL EFFECTS

The limited temperature data available indicate a maximum temperature of 74°F (July 16, 1969) in the Abitibi River at Onakawana. Flow data for the river at the same location suggest that flow volume under critical conditions is reduced to approximately 700 cfs. Information provided on the proposed thermal generating facility suggests that the cooling water requirements for the 900 megawatt plant would exceed the total river flow under low flow conditions so that no water would be available for dilution of the cooling water. Recognizing that the maximum temperature probably coincides with low flow conditions and the upper lethal incipient temperature of the common white sucker, for example, is 86°F, it is readily evident that the Abitibi River has severe limitations both with respect to providing the volume of water required for cooling purposes and the provision of dilution water to protect the aquatic ecosystem from unacceptable temperatures. Even under higher flow conditions the existing mode of regulating stream flows of the Abitibi River, which allows for extreme daily fluctuations in the volume of flow, would result in unacceptable temperature shock to the native fish species and other life forms.

Thermal effects unquestionably constitutes the most serious problem which has to be resolved relative to water quality considerations. While the use of the Abitibi River for once-through cooling is totally unacceptable there are several potential solutions to the thermal effects problem which should be explored. Some of these potential solutions are as follows:

7.11 Provision of cooling towers or the use of cooling lagoons to reduce temperature of the cooling water to an acceptable level.

7.12 Alteration of existing flow regulations on the Abitibi River to ensure an adequate and continuous source of dilution water.

7.13 Construction of a storage reservoir on the Abitibi River below Otter Rapids for the provision of the necessary dilution water.

7.14 Regulating power production at the proposed generating plant to coincide with periods of streamflow above a specified volume.

7.15 Location of the thermal generating facility on the Moose River in order to make use of the larger volume of dilution water carried in the Moose River.

7.16 Making use of the dilution capacity of both the Abitibi River and the Moose River through construction of a channel or pipeline to carry a portion of the cooling to the Moose River.

Current thinking tends to favour the construction of a dam on the Abitibi River at Onakawana. Before any firm decision is taken additional information must be obtained and assessed. This includes the ability of the streambed at Onakawana to support a dam structure; the quantity of water which could be provided from such a structure on a sustained yield basis, the temperature profile of the river at Onakawana; the temperature requirements of aquatic life within the river, and the migratory movements of fish species in the Abitibi River.

7.2 CHLORINATION OF CONDENSER WATER

Chlorine utilized for purposes of controlling fouling within the condensers at the proposed thermal generating facility could create serious conditions if adequate dilution is not provided. In this operation a residual of 1.0 mg/l is normally provided.

A residual of this magnitude would be directly lethal to aquatic organisms. For example, trout species will not survive in waters having chlorine concentrations in excess of 0.03 mg/l/. An engineering solution to the problem of thermal effects should also take cognizance of the dilution required to produce a safe chlorine residual.

7.3 ASH DISPOSAL

The lignite-fired furnaces at the proposed Onakawana plant will be equipped with precipitators for removal of fly ash. Water which is utilized to transport the precipitated fly ash will require consideration for disposal purposes. It is impossible to predict the precise nature of this water but it would be expected to be higher than the natural background in dissolved solids content. The quality of the water transporting the bottom ash will be altered as well.

7.4 FLOW REGULATIONS

As noted the Abitibi River at Onakawana is severely restricted in terms of productivity and usefulness owing to upstream operations at hydro generating facilities which regulate flows for peak power production. The daily low period of flow exposes approximately three quarters of the streambed

at Onakawana. This reduces the biological productivity of the river to one quarter of its potential. Any decision reached relative to the proposed development at Onakawana cannot ignore the necessity of stabilizing flow conditions.

7.5 DIVERSION OF THE ONAKAWANA RIVER

In order to develop the lignite deposit it will be necessary to divert the flow of the Onakwana River, presumably to the Abitibi River, at a point upstream of Onakawana.

This diversion will result in disturbance of clay particles along the new channel during the construction phase and bank erosion once the diversion has been accomplished. While the water quality of the Onakawana River near its mouth will undoubtedly be poorer than its natural state, this condition is not expected to have any detrimental influence on the Abitibi River owing to its existing high turbidity and suspended solids levels. With normal precautionary measures the net effect on water quality should be minimal.

The Onakawana River is utilized fairly extensively by canoe parties in order to avoid long portages necessary on the Abitibi River in the Long Rapids area. The utility of the Onakawana River for this purpose will not be altered by the Diversion since the new channel would connect with the Abitibi River below the Long Rapids.

It is not known if there is a natural movement of fish species to and from the Onakawana and Abitibi Rivers. If the development necessitates the construction of a dam on the Abitibi River at Onakawana, a physical barrier will be imposed between the natural and diversion channels of the Onakawana River and could inhibit migration.

7.6 MINING THE HEADWATERS OF MEDICINE CREEK

It would appear that development of the Onakawana lignite deposit would necessitate drainage and physical destruction of the headwater portion of Medicine Creek. The creek is a dark coloured body of water with little gradient and considerable depth. With proper precautions the necessary alteration of Medicine Creek would probably have only a minor influence on water quality in the creek and the destruction of the head-water area would not constitute a serious loss of aquatic life.

7.7 MINE WATER DISPOSAL

Mine water from the open pit operation would probably be of poor quality and unsuitable for direct disposal to any of the water courses in the area. While the available information suggests that the mine water will be alkaline in nature and no pH problem would be anticipated with its disposal, high dissolved and suspended solids concentrations are possible. The most

significant problem will probably be one of poor colour and turbidity characteristics which, from aesthetic and biologic considerations, may mean that the water will be unsuitable for direct disposal. Some form of treatment of the mine water will be necessary.

SECTION VI - BIOLOGY OF THE REGION

A. VEGETATIONAL CHARACTERISTICS

The Onakawana area is in the "dry zone" of the Hudson Bay Lowlands. The dry zone is defined as being 30 percent muskeg and swamps, 30 percent lakes and rivers and 40 percent relatively dry land. The Onakawana area does not have such a high proportion of open water.

The major plant associations are arranged in strips which parallel the rivers. Good stands of timber located along the well drained river banks give way to transitional forest and then to black spruce muskeg located in the interior where the drainage is poorer. The major forest types are described below.

8.1 BLACK SPRUCE MUSKEG

The black spruce muskeg is the most extensive forest type in the area. As a result of poor drainage it is ombiotrophic. There are few species present, the dominant one being black spruce which grows to a maximum of twenty-five feet. The trees have a density estimated at 194 per acre near the edges of the muskeg decreasing to 109 per acre in the central area. These central areas are nitrogen deficient and spruce occurs in clumps and the individual trees average about six feet in height. The sphagnum in this type grows 1/3 to 1/2 an inch per year while tree growth is 1 to 1½ inches a year. Flow patterns are present in the muskeg showing areas of slightly better drainage. It is hypothesized that these are the result of glacial deposits from melt streams or alluvial deposits of previous rivers. The flow islands support vegetation similar to that of the transition zone between the black spruce muskeg and the better drained mixed feather moss forest. Ericaceous shrubs are better developed in the flow islands. Dry pits which are covered with lichen and cloudberry form around the spruce trees.

In the transitional zones glanded birch and willow species are abundant. A few larch are present.

8.2 MIXED FEATHER MOSS FOREST

The mixed feather moss forest is located in the better drained areas along the edges of the river valleys. The forest floor is swampy and water collects into pools. Black spruce, 25 to 40 feet in height, are interspersed with larch, balsam popular, white spruce and balsam fir, all about five to six inches in diameter. The trees and an undergrowth of speckled alder heavily shade the ground vegetation.

8.3 WHITE SPRUCE FOREST

The white spruce forest found on the riparian terraces has been heavily logged in the past. A sawmill at Onakawana

utilized the white spruce of the area for the production of mine props between 1945 and 1950. The removal of the white spruce has allowed balsam popular to attain a considerable size. Larch, aspen, white birch, balsam fir and black spruce occur, but only in small numbers.

8.4 DISTURBED AREAS

A number of areas have been sufficiently disturbed to produce a vegetation that is different from the surrounding areas. Logging operations in some areas have resulted in a secondary forest of white birch, balsam popular and trembling aspen. The river banks are dominated by willow species and red-osier dogwood, mixed with a number of more southern species. Along the railway embankment a "meadow" vegetation, with plants such as vetch, common plantain, savory, bedstraw, willow, crow-foot, white daisy, goldenrod and fireweed, has developed. The railway drainage ditches have promoted growth of black spruce within a four foot margin to either side of them but where the ditches have not been kept clear the spruce have died back. The vegetation on the eastern shore of the bend in the Mattagami River, located southwest of Onakawana, shows evidence of flooding which indicates that the Mattagami has overflowed in the past. From this it is hypothesized that the Mattagami acts as a seasonal source of Medicine Creek which lies a quarter of a mile away.

The lignite piles and spoil areas left by previous mining activities have less than 10 percent vegetation cover on them. Plants now growing on these materials include horsetail, timothy, dandelions, evening primrose, clover, white meliot, squirreltail grass, knotweed, balsam popular, goldenrod and a few orchid species.

The vegetation of the Onakawana area is quite similar to that of the surrounding region and no species were found that are unique to the particular area. The relative productivity of the muskeg is low and, although there is good growth on the well drained site, forest stands in the area that will actually be disturbed by the exploitation of the lignite have relatively little economic value.

8.5 IMPACT

The vegetation in the Onakawana area will be cleared from those areas where mining and construction will take place. It is not likely that this will damage the surrrounding vegetation. The surrounding vegetation could possibly be affected by the operation of the generating station through the release of sulphur dioxide and nitrous oxides with the stack gases. The Air Management Branch of the Ministry of the Environment stated that if the plant utilized a stack height of the order of 500 feet to overcome local air inversions and had efficient electrostatic precipitators installed to control the release of particulate matter and metal oxides, no problem of downwide vegetation kill will occur.

B. FISH AND WILDLIFE

9.0 FISH

9.1 ABITIBI RIVER

The biological communities of the Abitibi River are affected by the daily fluctuation in water level resulting from the operations at the Otter Rapids Hydro Dam thirty-five miles upstream. Throughout August the river fluctuated 2.5 to three feet which results in the exposure of approximately three quarters of the riverbed. The fluctuating water levels and ice scouring during spring breakup have eliminated aquatic vegetation in the river and only a sparse growth of cattails, grasses and arrowheads occur along the summer high water line. Netting of the Abitibi resulted in a catch of four white suckers, one northern redhorse sucker and one yellow walleye.

Nets set in the test pit, which is flooded by the Abitibi during spring runoff, yielded 16 northern pike, one white sucker, three northern redhorse suckers and five longnose suckers. Dip net collections included white suckers, logperch, Johnny darter, leaches, snails, crayfish, water boatmen, crane flies, and caddis flies.

The district biologist for Cochrane reported that sport fishing in the Abitibi between Coral Rapids and Moosonee was quite poor. However, local residents reported a yellow walleye run in the spring at the junction of the Abitibi and Onakawana Rivers.

Local residents reported catching trout at the mouth of Medicine Creek for the first time this spring. This could be indicative of a trout population in the Abitibi River although the district biologist reported that no sea run trout migrate past Kwataboahegan Rapids, 50 miles downstream. Sturgeon have been reported in the Abitibi at Onakawana. The Commercial Fisheries Branch of the Ministry of Natural Resources states that a commercial fishery for sturgeon may be possible downstream but at the present time the most northern fishery on the river is in the vicinity of Fraserdale.

9.2 ONAKAWANA RIVER

The Onakawana River has a patchy vegetative growth in those areas which are protected from ice scouring during spring breakup. Waterweed and arrow-head are present as well as cattails and aquatic grasses in backwaters.

Nets set in the Onakawana River yeilded 19 white suckers, 16 yellow walleye, 12 northern pike, and three lake sturgeon. Hand nettings resulted in catches of white suckers,

blacknose dace, trout-perch, Johnny darter, sculpin, snail, crayfish, mayfly, stone fly, midges, and caddis fly cases. It should be noted that there is a large population of crayfish in the river.

The Ministry of Natural Resources reported that while there is a good trout fishery upstream from Onakawana in the vicinity of Coral Rapids and Fraserdale the trout population does not extend as far north as Onakawana, although during the winter months a small number are taken through the ice. The sport fish population of the Onakawana from Coral Rapids north consists of pike and walleye. The fishing in the vicinity of Onakawana is assessed by locals as being poor.

9.3 MATTAGAMI RIVER

The biological communities of the Mattagami River are affected by the operation of hydro dams upstream which cause daily fluctuations in the water level of the river. The river is devoid of aquatic vegetation except for large quantities of filamentous algae. Nets set in the Mattagami yielded 11 white suckers, five northern redhorse suckers, three yellow walleye and one northern pike. The Commercial Fisheries Branch of the Ministry of Natural Resources reported that the Mattagami River has a large sturgeon population, a population which has been exploited in the past but is not being fished at present.

9.4 MEDICINE CREEK

In many places Medicine Creek is choked with aquatic and terrestial vegetation. Nets set in the creek yielded two white suckers. The local residents reported catching "fair sized" pike from the lower sections of Medicine Creek and as previously mentioned trout were taken this spring as they moved upstream from the creek mouth. It was stated that this was the first time that trout had been caught in Medicine Creek.

The biologic communities of the Abitibi and Mattagami rivers in the vicinity of Onakawana have been reduced by the operations of the hydro dams upstream. While it is difficult to assess the aquatic biology of these two rivers on the basis of research done it would seem that while the present population of vertebrates and invertebrates is low, the biological capacity of the rivers has not been irreparably damaged. The Onakawana River appears to have good water quality and is producing a moderate population of fish.

10.0 BIRDS

10.1 WATERFOWL

Waterfowl observed in the area included the Canada goose, common merganser, and black duck, redhead, and common goldeneye. Only one nest, that of a black duck, was found.

The number of waterfowl observed was low. The birds used the area only in migration as there is a lack of suitable breeding and feeding habitat. Black ducks, redheads and common merganser were observed on Medicine Creek in the late season but it is not known if they had bred there.

The district biologist stated that when the migrating waterfowl leave James Bay on their way south most overfly the Onakawana area on a broad front at a high altitude.

10.2 UPLAND GAME BIRDS

Ruffed grouse and spruce grouse were observed in small numbers. No sharp-tailed grouse were observed although it has been reported that there is a "dancing ground" at Mile 125. Grouse populations fluctuate and it is possible that this was a year of low population.

10.3 NON-GAME BIRDS

A number of species of non-game birds have been recorded. The thicker forest along river banks provide a more varied habitat and a greater bird population than the black spruce muskeg.

As numbers of game birds in the area are low and the species of song birds found at Onakawana are those found throughout the region. The proposed development at Onakawana will probably result in a temporary and relatively minor disturbance of populations.

11.0 MAMMALS

11.1 FURBEARERS

Furbearers observed during the study were beaver, muskrat, and otter. The number of animal signs observed were small. Trap line records covering the Moose River Basin for the past ten years do not indicate the presence of an important fur resource. There is one beaver lodge for every 2.5 miles of shoreline within the area, excluding the Abitibi and Mattagami Rivers whose fluctuations make them unsuitable habitat. The main concentration of beaver lodges is on Medicine Creek. Only one lodge is located in the area to be mined and another seven are downstream. None were observed on the Onakawana River.

The development of the mine would result in the displacement of those animals using the site and the temporary overcrowding of surrounding habitat. There are presently two registered traplines in the Onakawana area, only one of which is being operated. The trapper of the active line stated that he derived an income of $2,000 to $3,000 in 1971/72 from his operation.

11.2 BIG GAME

Moose, woodland caribou and black bear were all observed in the area. The population of moose is reported to be low and the area is considered to be outside the normal moose range.

The caribou population is also low. The carrying capacity of the region is reported to be seven caribou per 100 square miles. Woodland caribou range widely throughout the region and apparently do not concentrate in the Onakawana area.

The impact of development on the moose and caribou will result in a temporary reduction of range and an increase in hunting pressure from the workers at the development. The effects will be local.

Black bear were observed only after the establishment of the garbage dump at the camp. The bear population is low and transient. The population of black bear would not likely be affected.

11.3 PREDATORS

Predators observed in the area were the timber wolf and red fox. Timber wolf signs were found primarily about the garbage dump. Local residents reported that there were two breeding pairs of wolves in the general area. Signs of red fox were seen but rarely. It is thought that the population of red fox is greater than that of the wolves as there is a greater food source available to them. Fox appear only rarely in the trapping records for Onakawana.

11.4 OTHER MAMMALS

Other mammals, including porcupine, weasel, hares and shrews, mice and moles are in the area. In general their numbers were low and are likely to increase as a result of development.

12.0 AMPHIBIANS AND REPTILES

Those observed were the wood frog, the common toad and an eastern garter snake. For an accurate examination of these animals the area must be studied in spring and early summer. The impact on amphibian and reptile population is not likely to be major.

SECTION VII - ECONOMIC AND SOCIAL IMPACT

The following is an assessment of the probable economic and social impact of the proposed lignite mining operation and its associated electric power generating station at Onakawana.

It is visualized that the construction of the 900 megawatt thermal electric station will extend over a five-year period. At the peak of construction activity, a work force of about 1,650 men will be employed. Preparation of the mine site, to be carried on concurrently, will involve relatively few men.

Lignite is available to fuel the plant for a minimum of thirty years. It is estimated that 250 men will be employed at the mine site during operations, with a further 150 men needed to run the generating station.

A. PARAMETERS OF THE ANALYSIS

The local economic impact will come from primary wages and salaries generated. Consequently, impact calculations are confined to the area from which the bulk of the required labour force is likely to come -- the Cochrane District. Therefore, if demand for specific goods and services generated at Onakawana cannot be met, or is not likely to be met, by a supplier within Cochrane District, then that demand is not considered to have an economic impact upon the District. On this basis, the capital outlay of $290 million for the generating station and mine will have a considerable impact, but far from the order of $290 million, in that machinery, equipment and construction material will come from outside the District. Of local significance will be part of the wages and salaries paid during construction, transportation charges payable to the Ontario Northland Railway, and minor local purchases of supplies and equipment. It seems unlikely that more than some 20 per cent of the disposable income of the total work force plus wages paid workers from the District plus an estimated $4 million paid to the Ontario Northland Railway for transportation, plus miscellaneous supplies purchases will have local impact. These flows would add up to $27 million to $30 million.

The economic sectors included in this impact assessment have been derived by judgement rather than through an exhaustive identification process with either Manalta Coal Company or Ontario Hydro. During the construction phase only the following sectors are considered to be affected in a significant way: construction, transportation services, retail trade, personal services; and households (labour supply). During the operating state the sectors which will be affected include the above, plus storage, communication and utilities, finance, insurance and real estate, community services, and local government.

The primary impact during the construction stage, as already noted, will come from wages and salaries paid to local residents, plus that part of total work force income spent locally on food, recreation, accommodation, and other goods and services plus transportation charges on movement of equipment, supplies and materials to the site, plus miscellaneous purchase of capital goods and operating supplies.

Secondary impact will be derived from employment and further income generated in satisfying demands arising from the first round of spending. Third and possibly subsequent rounds will also be generated, but no attempt has been made to calculate effects beyond the primary impact stage.

The primary impact during the operating stage will come from wages and salaries paid to resident members of the work force, purchase of freight transportation services from Ontario Northland Railway, and local purchases of other goods and services needed at the mine and station sites. Secondary impacts include stimulation of the construction industry to produce housing for new residents, required school space, new shopping and service outlets and the like. It includes wages and salaries paid to those providing such services as retailing, health, education, local government, transportation, finance, insurance and real estate services, Third round spending will come from the demands of new workers necessitated by the second round. Because of the limited size and simple economic structure of the District, its economy is very "open" and multiplier effects are almost completely confined to non-manufacturing sectors. The increased demand for manufactured goods will be largely satisfied from other parts of Canada and abroad.

Application of overall multipliers derived in urban areas could be misleading, because of "leakage" and the relative absence of manufacturing in the District.

B. IMPACT CALCULATIONS

Separate analyses have been made of the impacts flowing from the construction stage and the operating phase, the latter assumed to be thirty years. Impacts from construction have been calculated for the primary level.

14.0 Construction Phase

Construction of a 900 Mw thermal generating station will take five years. On the basis of Ontario Hydro's experience about 1,650 men will be employed at peak, of whom about 1,450 will be tradesmen and labourers and about 200 will be supervisory staff.

The expected variation in size of the labour force over the five year period is as follows:

end of first year	-	400
end of second year	-	1,300
middle of third year	-	1,650
end of third year	-	1,450
end of fourth year	-	800
end of fifth year	-	50

Again, Hydro's estimates of kinds of trades required, for a project of comparable size, indicate that the peak labour force would be made up of:

Pipe Fitters	-	27%	Boilermakers	-	15%
Electricians	-	12%	Ironworkers	-	11%
Labourers	-	8%	Carpenters	-	7%
Operating Engineers	-	7%	Others	-	13%

Erection of draglines, construction of buildings and preparation of the mine site for production will involve at peak a total of 50 to 75 men. About half the work force will be such skilled workers as welders, steel erectors, heavy duty mechanics, electriciansand half will be general labour.

14.1 Money Flows

At peak employment, wages and salaries paid at the generating station construction site are estimated at $23 million per year (1972 wage levels). Estimated wages and salaries will total about $55 million over the five year construction period.

Wages and salaries paid at the mine site at peak employment levels during the preparation phase will total $850,000 - $900,000 per year (1972 wage levels). The outlay for labour could total as much as $2 million over five years.

Only that part of labour income accruing to residents of the Cochrane District, plus that part of income of the remainder of the work force spent locally for goods and services, will have an impact upon the District.

It is estimated that up to one-third of the total work force required for station construction and mine preparation can be expected to be drawn from Cochrane District. This will mean that at peak employment levels close to 600 local workers will be employed. Effective buying income, estimated at 70% of total income generated by these workers, can be expected to add up to $13 million to $14 million over the five years of construction activity.

It is also estimated that effective buying income of non-local workers will total at least $30 million to $32 million over the construction period. It is assumed 20 per cent of this will be spent within the District for goods and on such things as restaurants, hotels, transporation, and recreational facilities for a total of some $6 million over the five years.

It has been estimated that up to $4 million in added freight revenue will accrue to Ontario Northland Railway over the contruction phase.

The bulk of the equipment, building needs and everyday supplies during the construction phase will be obtained on a contractual basis from large contractors. Local involvement, aside from minor retail sales, will be limited to storage and trans-shipment of materials obtained from outside.

14.12 Summary of Primary Impacts

The primary impact should include the provision of as much as 1,400 man-years of employment at the construction site for residents of Cochrane District, generating $13 million to $14 million in labour income. A further $4 million in increased freight revenues will accrue to the Ontario Northland Railway.

Second round spending by the resident recipients of income and by other members of the work force on recreational pursuits, will increase receipts of existing business establishments of the District, and will increase employment in the trade and personal service categories. However, estimates of the location and magnitude of increased expenditure and employment at this time would be conjectural.

Experience in other isolated projects during the construction stage indicates that few members of the work force would be likely to bring families to the project area. It is not likely that urban areas in the District would experience a significant increase in housing demand during the construction period.

15.0 Operating Phase

As noted, the estimated economic life of the proposed mine and generating station is a minimum of 30 years, according to Onakawana Development Limited. Annual production of lignite will be approximately five million tons. Primary impacts during the operating stage are estimated as follows:

15.10 Employment

The estimated size of the mine work force, including supervision, will be about 250 men. The total staff required for the generating station will be about 150.

Of the mining work force of 250 men, an estimated 39% or 95-100 men will be heavy equipment operators (dragline, bulldozer, shovel and truck), about 22% or about 55 men maintenance men (heavy duty mechanics, machinists, electricians and welders), and a further 22% general labour such as pump men and oilers on shovels and draglines. About 15 men will be required as office and warehousing staff and the remainder will be supervisory staff including mine managers, assistants, pit foremen, engineering and electrical supervisors.

Of the staff required to operate the thermal generating station, about 120 will be control room operators and senior maintenance personnel. These employees will have undergone extensive technical training. The remaining staff will be made up of maintenance men and junior mechanics' helpers.

15.12 Money Flows

Annual wages and salaries payable to the proposed mine work force have been estimated, using recent union wage rates applicable to north-eastern Ontario. Wages and salaries payable at the generating station have been estimated from base data supplied by Ontario Hydro. Aggregate wages and salaries at the mining operation are projected at $2,900,000, with a further $2,400,000 payable at the generating station. The annual total of $5,300,000 refers to 1972 wage levels, and no attempt has been made to estimate wage escalation. It is assumed that the entire impact of wage and salary payments will fall within the District.

Other primary money flows will stem from payments to Ontario Northland Railway for freight movement. No estimate for this sector are available, but it can probably be assumed that payments will not exceed $200,000-$250,000 per year.

Again, no estimates for local purchases of supplies or equipment are available, but it seems unlikely that they will exceed $100,000 per year.

15.13 Secondary Impact

The total population increase resulting from establishment of a new work force of 400 men has been calculated on the basis that 100 workers will be drawn from the Moosonee-Moose Factory area, and that the remaining work force of 300 will be drawn from outside the District. A population increase factor of 3.5 for each worker from outside has also been assumed.(1) Consequently, the population increase would total 1,050.

It is estimated that up to 50 new jobs in retailing and personal services will be created by demand from the additional population and by increased spending by workers resident in Moosonee-Moose Factory.(2)

Employment in community services will be strongly affected by demand from the calculated population increase. The assumed additional school population of 450, will create at least 30 additional jobs in education (teachers, other professionals, maintenance personnel). It is calculated that up to 55 jobs will be opened up by such community services as education, health services, religions, welfare.

(1) The permanent population likely to be attracted by a total of 400 jobs has been estimated by calculating the ratio of labour force to total population as of 1961, in two relatively isolated labour markets -- Iroquois Falls and Smooth Rock Falls.

It is also likely that 40-50 jobs will be created in other sectors -- the Ontario Northland Railway (additional train crews to operate extra passenger service between the work site and dormitory areas), other transportation, communication and storage services, and local governments. It is possible to foresee a secondary impact totalling up to 150 new permanent jobs.

A further facet of secondary impact will be the demand for new housing. It is likely that the 100 assumed workers from Moosonee-Moose Factory will already have housing available. This will leave a potential 300 workers with a demand for housing. Investigation of housing vacancy rates in Fraserdale and Cochrane, the two most obvious locations for workers' families, reveal no vacancies in the former and very few in the latter. It must be assumed that only a limited number of rental units will be available and that up to 200 new units will have to be built.

(1) cont.
In the former, total population is 3.3 times the labour force, and in the latter it is 3.0 times larger. The ratio of Ontario males between the ages of 20 and 64 to total provincial population in the 1971 census was also calculated as an additional gauge, and was found to be 3.7. Accordingly, it seems likely that associated with the jobs (it is assumed that 100 jobs would be filled by residents of Moosonee-Moose Factory and area who would continue to live in the same locality) would be a population increase factor in the range of 3.0 to 4.0. A factor of 3.5 has therefore been used.

(2) The estimate of new retailing jobs was derived as follows:
Sales Management reports that total retail sales in Cochrane District in 1971 were $132.8 million, and that persons employed in retailing totalled 2,371. Thus, average sales per employed person were $56,000. It is assumed that at least one-third of sales from increased disposable income would occur in existing establishments, without increases in employment and that the remainder would create new jobs.

Best estimates are that cost of construction of 200 houses in northeastern Ontario will total close to $5 million. If it is assumed that demand for the 200 units were to be met, in one location, over a two-year period, then at least 100 construction workers would be required on a continuous basis over that period. This would not include labour needed to lay out and service a subdivision. It is likely that wages of at least $1 million would be paid to the housing construction workers over each of the two years of the construction period. Only a part of this would be spent within the District, but it is established that $500,000 - $600,000 per year would pass through local hands. Some impact will also be felt from local purchase of construction materials.

16.0 Summary of Primary and Secondary Impacts

In terms of employment, the primary impact is the creation of 400 jobs. The sum of demands in the primary stage would be expected to create a further 150 permanent jobs as a secondary impact, plus about 100 temporary jobs in construction.

Money flows in the primary stage would add up to at least $4.6 million per year (disposable labour income, transporatation services, local purchase of goods and services). Secondary impact will include further disposable income of about one million dollars per year from new jobs created by the first round impact, plus temporary labour income of another $500,000 plus another $200,000 - $300,000 per year from induced purchase of goods and services. Total money flows from primary and secondary rounds, exclusive of temporary activity, will come close to $6 million per year.

No attempt has been made to calculate effects beyond the secondary impact level, but subsequent rounds of spending probably will result in the creation of perhaps a further 50 or so jobs. This would give an overall job multiplier factor of 1.5 -- 400 jobs at the station and mine would lead to a further 200 jobs in other activities.

17.0 Availability of Local Labour

The manager of the Canada Manpower Centre, Timmins is of the opinion that the required skills and labour for both generating station construction and mine preparation is available within north-eastern Ontario. When the Texas Gulf Sulphur property was opened near Timmins a skilled work force of 1,000 men was readily assembled, some coming from as far as Sault Ste. Marie and Sudbury.

Of further interest is the possibility of employing native labour from the Moosonee-Moose Factory area. It has been determined that up to 300 workers with the kinds of skills required at either the generating station construction site or the mine site are located in the Moosonee-Moose Factory - Fort Albany and Attawapiskat area and many of them are unemployed.

The kinds of skills found in the labour force in the area are listed in Table II. Practically all of the listed skills are expected to be in demand at Onakawana during the construction phase.

TABLE II

EXPERIENCED AND/OR TRAINED MEN AVAILABLE IN THE MOOSONEE-MOOSE FACTORY-FORT ALBANY-ATTAWAPISKAT AREA, NOVEMBER, 1972.

TYPE OF SKILL	NUMBER
Construction labourers (including rough carpentry)	150
Carpenters (on-the-job training, mainly)	22
Electricians (most with journeyman's certificate)	11
Bricklayers	10
Welders (half have had on-the-job training and half have had training courses)	10
Pipefitters	5
Heavy Duty Mechanics (2 have completed a 10 month diesel mechanics course)	12
Machinists	1
Ironworkers	1
Auto mechanics	10
Tandem truck drivers	29
Bulldozer Operators	9
Loader Operators	9
Backhoe Operators	11Gr
Grader Operators	6
Shovel Operators (hydraulic)	4
Diamond Drillers	7
Electric technicians (have 2 years of community college)	6
Mining assistant	1
Total	314

Source: Bill Louttit, Branch Manager, Canada Manpower Centre, Moosonee.

For the operating phase up to 90 per cent of the jobs likely to be created in the mining project are in trades in which some of the Moosonee-Moose Factory native labour force have been trained. In theory up to 225 jobs for which the local labour force have training and/or experience could be available. A further 30 jobs in generating station operation would be of the type for which the Moosonee-Moose Factory labour force qualify. In total just over 250 jobs for which the nearby native labour force nominally qualify could be created within a decade.

For the 120 or so control room operator jobs in the generating station the native labour is qualified in that a minimum of a Grade 12 education is required and this educational level is being attained by an increasing proportion of the entrants to the labour force in the Moosonee-Moose Factory area. However, Ontario Hydro trains its operators by rotating them through a variety of work experiences in a variety of locations and over an extended period. Such a training program could conceivably hamper attempts to recruit members of the native population of Moosonee and area.

A rough indication of the quality of the labour force in Moosonee-Moose Factory and area can be obtained from statistics on unemployed males registered at the Canada Manpower Centre at Moosonee as of October 31, 1972. These show that of the 135 males registered, 68 have a Grade 8 education or less, while 58 have Grade 9 or more and 10 have some college training. A substantial number, 38 out of 135, have taken Canada Manpower Training Plan trades training. Courses represented include heavy equipment operation, small motors, advanced carpentry, rotary diamond drilling, electronics and welding. Those with work experience include dump truck drivers, bulldozer, loader backhoe and grader operators, carpenters, diamond drillers, small engine mechanics and a hoisting engineer. The age categories of the registered unemployed are: less than 24: - 41: between 25 and 44: - 81: over 45 - 13.

As noted, of the 400 jobs to be filled during the operating phase, about 250 are of the type which the foregoing review of qualifications indicates could be filled by the Moosonee-Moose Factory labour force. However, for the purpose of making impact calculations, it has been assumed that 100 workers from the area would be employed.

18.0 Other Miscellaneous Factors

Two factors of peripheral interest to this analysis are: (a) consideration of possible housing locations for the expected inflow of population; and (b) adequacy of existing Ontario Northland Railway equipment and scheduling to handle passenger traffic between Onakawana and locations of families, during the operations phase.

19.0 Possible Locations for New Population

Among possible locations for workers' families, three stand out -- Cochrane, Moosonee, and Fraserdale. Although Moosonee, 60 miles from the construction site, is the nearest urbanized area, it has no road connections with the rest of the province, and its ability to absorb a sizeable increase in housing without a relatively expensive addition to urban infrastructure is questionable. Fraserdale already is a substantial community, has a good road connection to Highway 11, is equipped with recreation facilities, and presumably could be expanded. However, it also has the disadvantage of being a relatively isolated community. Although Cochrane is 126 miles from Onakawana, via the Ontario Northland Railway, it has a population of more than 5,000, provides a range of services and is located on Highway 11. In addition, a recent Industrial Survey report by the Ministry of Industry and Tourism indicates that water and sewage services are adequate for a population of 7,000, a reserve which would accommodate the population increase envisaged.

The fact that it is not feasible to house families at the Onakawana work site, but rather at a distance of at least 60 miles, indicates the need for a system whereby the employee could work a solid block of time and then have a number of days off. This in turn would mean that substantial sleeping and dining facilities will have to be provided at the site, and that train schedules to allow convenient commutation between the site and Fraserdale or Cochrane and the site and Moosonee will have to be established.

A permanent work force of 300, exclusive of those drawn from Moosonee-Moose Factory and area, will have major implications in terms of housing demand, regardless of the settlement point chosen. Even if allowance is made for a proportion of single workers, and for availability of a limited number of rental units, it seems likely that at least 200 housing units will have to be built. If Cochrane were to be selected as the settlement point it appears necessary to construct practically all of the housing units needed. According to the latest housing demand survey by the Ontario Housing Corporation at the end of December, 1969, housing stock consisted of 1,201 units. A total of 45 units were added to the stock over the 1966-1969 period. The report indicated that the supply of rental units was very limited, particularly new apartment units. It was also reported that the price of new three bedroom houses ranged from $15,000 to $30,000.

On the basis of the above estimates and reported data, the cost of providing houses for workers attracted to Onakawana will be substantial. Obviously, a large increase in housing construction will be called for. It is estimated, very approximately, that housing costs ranging up to $5.0 million will be incurred. (200 houses at a value of $25,000 per unit). As noted, Cochrane appears able to accommodate the projected increase without additions to water supply and sewage facilities.

An alternative possibility would be to house all of the Onakawana labour force at Fraserdale, or just that part of it (exclusive of labour coming from Moosonee and area) working at the generating station. Given the latter possibility, up to 120 housing units would be needed at Fraserdale, with as many as 80 still needed at Cochrane.

A brief review with Ontario Hydro personnel of Fraserdale's facilities indicates that its housing supply of 85 units are all occupied, and that an increase in housing would likely call for an expansion of the community's water filtration plant and sewage lagoon system. It should also be noted that Fraserdale has a primary school, but that secondary school students are bused to Smooth Rock Falls, a one-way trip of 47 miles.

It is not feasible in this analysis to estimate total housing costs -- housing units, roads, water and sewer facilities, -- for the two assumed alternative locations, nor is it necessary to do so. The point of the analysis is to establish that housing costs are almost certain to be substantial and that involvement on the part of the Government and/or the company may be necessary to ensure availability of an adequate number of units.

20.0 Implications of Increased Passenger Traffic

During the construction phase a considerable number of workers will have to be moved to and from the work site at regular intervals. Ontario Northland Railway has 10 coaches which are used only during the summer months and are currently leased to the GO transit system in Toronto. These 10 coaches should be more than adequate to handle the number of workers involved, and presumably could be replaced by coaches leased from elsewhere during the summer months when they are in regular service. It would appear that no significant capital expenditures would be required by the Ontario Northland Railway in order to handle the increased loads projected during the construction phase.

In reference to the operating stage of the project, it would appear that adequate transportation for off duty workers going to Moosonee and to Cochrane and/or Fraserdale could be provided by reorganization of railway schedules.

More frequent scheduling would perhaps necessitate an addition to railway operating perosnnel, but would not appear to force capital expenditures for new equipment by the Ontario Northland Railway

SECTION VIII - ADDITIONAL WORK TO BE DONE

A. WITH REGARD TO THE LIGNITE DEPOSIT AT ONAKAWANA

Task Force Onakawana, during the course of this examination, has gained an understanding of the environmental changes that might be expected to result from the proposed development lignite deposits. Because of the urgency of coming forward with a general group of recommendations, it was not possible to study seasonal changes or longer term trends.

It is the view of Task Force Onakawana that research work should continue under the purview of the appropriate Ministries and that a special fund should be established to cover the costs of this work.

Data is available and part of the continuing program will be the further utilization and analysis of this data. Indicative of the kind of analysis and research that should be undertaken is the following:

1. WATER.

i) Surface Water Resources

Further investigations should be made of the variations of stream flow to determine with some precision the ability of the rivers of the area to provide cooling water and to receive water which has been altered from the ambient in terms of temperature, or quality. Water quality and temperature profile should be determined over one annual period.

2. BIOLOGY

i) Photographic Reconnaisance

Adequate photographic records should be assured.

ii) Biologic Inventory

A competent team of biologists should be charged with assessments of ungulates, fur-bearers and fish in the area that will be altered by this development. This assessment should include population counts or estimates, migration patterns and other such activity as will be required to provide a reliable assessment of the biologic potential of the affected area.

3. CONTINUING ASSESSMENT

A competent team of ecologists should examine the engineering-economic report and relate its determinations to the perceived environmental needs of the area.

B. WITH REGARD TO BAIE JAMES PROJECT

The Task Force has been instructed "... to give further consideration to the environmental impact of the Baie James Project, seek the views of any groups which have studied the project and report its findings at the same time as it reports on the Onakawana Project".

The Task Force obtained an extension of the deadline for this section of the project because the relationship of Baie James developments to the environmental impact of the development of the lignite deposits at Onakawana appeared to be remote. It is suggested that a subsequent examination be undertaken and be specifically focused on Baie James.

A preliminary examination of the Baie James Project reveals that, while the project has been much discussed, little concrete information on the intended procedures and timing of the project has been made public.

In a subsequent report Task Force Onakawana will examine additional information as to the precise development plans of the Quebec Government, will consult with interested groups in order to determine the concerns which these groups may feel about the Project and will arrive at preliminary conclusions as to the environmental impact of the proposed developments on Baie James. It will make recommendations as to the best way to ameliorate the impact on Ontario of the Baie James Project.

STUDY PROCEDURES

The Task Force divided itself into four major teams studying the hydrology, the biology, the soil conditions and the implications of the proposed Onakawana project to job creation in the area. Background information was obtained from a search of present ecological literature, file data and personal interviews. Nine weeks of field studies were carried out by various parties over a three-month period. The field work included examination of the soils and overburden, the chemistry and biology of the rivers and streams, the hydrology of the site, the vegetation, fish and wildlife of the site and surrounding area and the training of the labour force in the area.

Each of the teams prepared a report to which were added the information gained from public hearing and briefs submitted by interested individuals and groups. Copies of these reports have been filed with the Office of the Provincial Secretary for Resources Development and are available for examination.

The costs of amelioration have, of necessity, been dealt with in a superficial manner. The Manalta Coal Company proposes an economic and engineering feasibility study to assess the potential of the proposed mine and power generation complex, but at the time this report is being written, work on this feasibility study is just about to begin. Task Force Onakawana has not had the benefit of firm knowledge as to the developmental procedures that will be followed and, as a consequence, in addition to making assumptions

as to the engineering of the site, has been forced to limit this examination to considering optimum procedures relative to the protection of the environment and to accept that costs of proposed amelioration will be quantified in any economic and engineering study that is subsequently undertaken. Governmental agencies, which will be evaluating the economic and engineering feasibility study, will be expected to assess the validity of costs of amelioration attributed in the final feasibility report.

ACKNOWLEDGEMENTS

The Task Force would like to acknowledge the assistance of a number of individuals who gave information which contributed to this study. Dr. E. E. Mackintosh, Dr. D. W. Hoffman and Dr. W. Chesworth of the Department of Land Resource Science, University of Guelph provided information on the soils and related development problems for the proposed development, and Mr. B. Ganong provided information of the Economic Impact of the development. Mr. R. Hedlin acted as technical co-ordinator of the report with the assistance of Mr. R. C. Burdett.

Date Due

MOE/REP/ARIX
Ontario Ministry of the En
Report of task force
Onakawana : A arix
c.1 a aa

1973 Date | Issued To

MOE/REP/ARIX
Ontario Ministry of the En
Report of task force
Onakawana : A arix
c.1 a aa

LABORATORY LIBRARY
MINISTRY OF THE ENVIRONMENT

LABORATORY & RESEARCH LIBRARY
MINISTRY OF THE ENVIRONMENT